This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD STOR
1913 .H814 1913
The modern hospital : its inspiration :
24503399089

Annex Anatomy

PLEASE DO NOT REMOVE THIS BAND

REMOTE STORAGE 1913

Please return at the circulation desk.
To renew your material call:
(650) 723-6691 ext. 3

Date due in Lane Library:

IBRARY
OP FUND

THE MODERN HOSPITAL

ITS INSPIRATION : ITS ARCHITECTURE

ITS EQUIPMENT : ITS OPERATION

BY

JOHN ALLAN HORNSBY, M. D.

SECRETARY HOSPITAL SECTION, AMERICAN MEDICAL ASSOCIATION; MEMBER AMERICAN HOSPITAL ASSOCIATION, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AND ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES; FIRST LIEUTENANT, MEDICAL RESERVE CORPS, U. S. ARMY

AND

RICHARD E. SCHMIDT, Architect

FELLOW AMERICAN INSTITUTE OF ARCHITECTS

WITH 207 ILLUSTRATIONS

PHILADELPHIA AND LONDON

W. B. SAUNDERS COMPANY

1913

Copyright, 1913, by W. B. Saunders Company

PRINTED IN AMERICA

PRESS OF
W. B. SAUNDERS COMPANY
PHILADELPHIA

PREFACE

In resigning the manuscript of this book to the publishers, the authors do so in full appreciation of its many shortcomings and of its unfinished character. In mitigation of the offense, they beg to recall to the public mind the sparsity of hospital literature, and the many rapid changes that are taking place in the science of hospital administration, that would render the literature of today valueless for tomorrow. If the wisdom of the many splendid hospital administrators has not been called into requisition more frequently in its pages, it is because there is practically no literature from the pens of these men to draw upon for inspiration.

If one of the authors has many times employed illustrations from the institution over which he has the honor to preside, it has not been in any vainglorious spirit, but solely for the reason that he has been more familiar with the workings of that institution than with many that may perhaps be doing things far better, and many of its methods of operation are expressions of his own convictions.

This book has the tremendous weakness of being a record almost wholly of the experiences of two men, and the authors have seriously pondered the question of how far a discriminating public will be willing to follow the experiences of an individual through a book the size of this. In justification, it may be urged that the history of mankind is a composite of individual life stories, and it is only an infinitesimal number of these millions of members of human society who have here ventured to record their own experiences, not in the hope of permanent fame or glory, but merely with the hope that there may be contained within its pages some new thought, or some old thought clothed in new garb, that may help some perplexed and tired worker, and if this shall come to pass, the book will not have been written in vain.

It will be noted that in many parts of the book reference is made to articles manufactured by individuals and firms, and the names and addresses of these firms are given. The authors and the publishers are quite aware of the opportunity that this arrangement offers for criticism, and perhaps for charges by interested people that it has been done by way of advertising, and perhaps for a price. In answer to this, the authors have only to say that not one single dollar has been paid by any one, excepting the authors, for any purpose in connection with this book, but the authors and publishers feel that if a recommendation of any article is worthy of serious attention on the part of the reader, then the reader has also a right to all the information at the authors' disposal, and this information must include the name and address of the person or firm from whom the article may be purchased.

No attempt has been made in this book to achieve a literary success. It is merely what its name implies—a book about the modern hospital, the inspirations that bring it into being, its architecture, its equipment, and its administration.

John Allen Hornsby,
Richard E. Schmidt.

Chicago, Ill.,
March, 1913.

29605

CONTENTS

	PAGE
INTRODUCTION	17
The General Hospital	17
The Charity Hospital	18
Mixed Hospitals	19
The Private Hospital	19
The Character of the Hospital	20
Financing the Hospital	20
Running Expenses	28
HOSPITAL ARCHITECTURE	33
The Site	34
Planning the Hospital	36
The Area Per Patient	40
Arrangement of Administrative Units	40
The Admission Rooms	40
The Locker and Sterilizing Rooms	43
The Kitchen	43
The Medical Unit	45
The Surgical Unit	47
The Operating Suite	47
Details of Structure	51
Foundations	51
Walls and Facings	52
Floor Construction	55
Roofing	58
Floor Surfacings	60
Base Coves	67
Stairs in the Hospital	69
Partitions	71
Furring	73
Window Frames	74
Woodwork	76
Plastering and Wall Finishes	78
Interior Painting	78
Screens	79
Weather Strips	79
Hardware	79
Blanket Warmer	80
Permanent Installation	80
Boiler and Power Supply	80
Heating	83
Pipe Covering	86
Lighting	87
Signaling Systems	91
Doctors' Call Systems	93
Sewerage and Plumbing	93
Water Piping	95
Plumbing Fixtures	95
Ventilation	100
Refrigeration	103
Vacuum Cleaning	106
Elevators	108
Divisions of a General Hospital	111
Administrative Departments	111
Kitchens	112
Dining-rooms	114

HOSPITAL ARCHITECTURE (*Continued*) PAGE

Serving-rooms ... 114
Dining-rooms ... 116
Diet Kitchens ... 116
Bakery ... 116
Sun Parlors ... 117
Apartments for Patients ... 117
Private Rooms ... 117
Private Wards ... 119
Public or Charity Wards ... 119
Infectious Department ... 120
Children's Hospital ... 121
A New Children's Hospital ... 132
Maternity Hospital ... 139
Architecture of the Small Hospital ... 140
Estimated Costs in Detail ... 155

EQUIPMENT OF THE HOSPITAL ... 157
Fixed Furnishings ... 157
Vacuum Cleaners ... 157
Blanket Warmers ... 159
Sterilizers for Institution Use ... 160
Mattress Sterilizers ... 163
Utensil Sterilizers ... 165
Typhoid Stool and Urine Sterilizers ... 167
Linen Sterilizers ... 168
Dressing Sterilizers ... 169
Water Sterilizers ... 173
Instrument Sterilizers ... 174
Combination Set ... 175
Furniture in the Hospital ... 176
Beds ... 176
Springs ... 178
Mattresses ... 178
Children's Beds ... 179
Interns' and Nurses' Beds ... 183
Nurse's Couch ... 183
Bed Rests ... 183
Bed Raisers ... 184
Bed Rollers ... 185
Tables in the Institution ... 187
Ornamental Tables ... 187
Bedside Tables ... 187
Side Tables ... 187
Children's Tables ... 188
Serving Tables ... 190
Head Nurse's Desk ... 190
Chairs in the Institution ... 190
Rockers ... 191
Morris Chairs ... 191
Ward Chairs ... 191
Wheel Chairs ... 192
Commode Chairs ... 194
Chairs for the Insane ... 195
Rugs ... 197
Screens ... 197
Bed Screens in Wards ... 197
Private Room Screens ... 198
Door Screens ... 198
Portable Bath ... 199
Decorations in Institutions ... 200
Draperies ... 200
Pictures ... 201
Frescoes ... 201
Books ... 202
Receptacles for Clothing ... 202
Equipment of the Operating-rooms ... 204
The Furnished Room ... 204
Operating-table ... 206
The Shelf Rack ... 209

EQUIPMENT OF THE HOSPITAL (*Continued*) PAGE
Instrument Tray Stand ... 211
Drum Stands ... 211
Sponge Rack ... 212
Irrigator Cart ... 212
Instrument Table ... 213
Arm Immersion Stand ... 213
Solution Rack ... 213
Goose-neck Reflector ... 214
The Sinks ... 214
Soap Containers ... 215
Instrument Cabinet ... 215
Purely Technical Apparatus ... 216
Anesthetizing Apparatus ... 217
Cautery Apparatus ... 218
Bone Drill ... 219
Cystoscopic Battery ... 222
Special Apparatus for Special Departments ... 223
Dressing-rooms ... 224
Dressing Carts ... 225
Gynecologic Table ... 225
The Kitchen Equipment ... 226
Ranges ... 226
The Kitchen Table ... 226
Dish Warmers ... 227
Steam Table ... 228
Dish Washers ... 228
The Sinks ... 231
Soup-stock Boiler ... 231
Vegetable Peelers ... 232
Meat Cutters ... 232
Bread Slicers ... 233
Vegetable Cookers ... 234
Coffee and Tea Urns ... 236
The Diet Kitchen ... 237
Butcher Shop ... 238
Store-rooms ... 240
Pastry Pantry ... 241
Serving-room Equipment ... 242
Individual Hot Trays ... 242
Food Containers ... 244
Food Cars ... 245
Equipment of the Small Private Hospital ... 247

OPERATION OF THE HOSPITAL ... 248
The Board of Directors ... 248
How Created ... 249
Authority ... 250
Committees ... 250
Board Meetings ... 251
Women's Auxiliary Boards ... 251
Superintendent of the Hospital ... 253
Relation to the Board ... 255
Relation to Attending Physicians ... 257
Relation to House Staff ... 260
Relation to Nurses ... 260
Relation to Business Management ... 261
Relation to Patients and Public ... 262
The Medical Staff ... 263
The Service Staff ... 265
Consulting Staff ... 272
The Adjunct Staff ... 273
Relations to Superintendent and Board ... 273
Relations to House Staff ... 274
Relations to Nursing Corps ... 275
The Open-door Policy ... 276
Relation of the Hospital to the Medical School ... 280
House Medical Staff ... 284
Duties of the Modern Intern ... 284
Duties of Junior Interns ... 285

OPERATION OF THE HOSPITAL (*Continued*) PAGE
In the Surgical Service 287
In the Obstetric Service 288
In Other Departments 288
Duties of Senior Interns 289
Methods of Choosing Interns 290
Rotation or Permanent Service 293
Limited Rotation 294
Relations to the Superintendent 295
Relations to Visiting Physicians 296
Relations to the Nurses 297
Relations to Patients 298
Relations to Each Other 299
By-products of Internship 300
Rules for Interns 301
The Modern Trained Nurse 304
History of Nursing 304
The English Nurse 306
Preliminary Training 309
Age and Temperament 309
Health of Probationer 311
Training-school in the Small Hospital 312
In the Large General Hospital 314
Distribution of Nurses 315
The Flying Squadron 316
Training-school Heads 316
Discipline in the School 316
Teaching Probationers 318
The Theoretic Training 319
Necessity for Rigid Technic 321
Length of the Course 323
Hours of Duty 323
Home Life of Pupils 324
Undergraduate Specials 325
The Graduate Special 327
Rules for Graduates 328
Graduates in Private Service 329
Nursing and the Public 330
The Curriculum 332
Male Nurses 335
Rules for Technical Department 337
Surgical Rules 337
For Children's Department 340
For Maternity Department 343
The Surgical Operating-rooms 351
Preparation of Material 351
Sponges and Gauze 351
Making Up Sponge Drum 352
Hysterectomy Gauze 352
The Long Pack 352
Laparotomy Binder Package 352
Contents of the Drum 352
Bandages 353
Solutions 353
Schleich Solution 353
Harrington Solution 353
Gelatin Solution 353
Thiersch Solution 353
Bichlorid Solution 353
Boric Solution 354
Iodin and Lysol Solutions 354
Ringer and Locke Solutions 354
Carbolic Acid Solution 354
Beta-eucain Solution 354
Sterilization of Solutions 354
Temperature of Solutions 354
Silkworm, Horsehair, and Silk 354
Wax 354
Care of Rubber Goods 355
Drainage 355

OPERATION OF THE HOSPITAL (*Continued*) PAGE
Soaps 355
Make Up of Trays 355
Preparation of the Room 358
Equipment of Shelf Stand 358
The Other Furniture 359
Preparation of Patient 359
Positions on Table 359
Preparatory Asepsis 360
Rules for Nurses 360
Preparation of Catgut 361
Rubber Gloves 365
The Test 366
Sterilization 367
"Firsts" and "Seconds" 367
The Surgical Anesthetic 368
Chloroform 369
Ether 369
Nitrous Oxid-oxygen 370
Ether and Gas Combined 370
Choice of Anesthetic 371
Cost of Anesthetics 372
Rules for Administration 373
Minor Technic in the Wards 376
Spinal Puncture 376
Venesection 377
Direct Transfusion 377
Subcutaneous Transfusion 377
Paracentesis 377
Wet Dressing Box 378
Preparation of Bodies for the Morgue 378
Department of Pathology 379
Who Shall Do the Work? 379
Where the Work is Done 381
The Ward Laboratories 382
The Central Laboratories 382
Instruments and Apparatus 382
Microscopes 382
Incubators 383
Laboratory Sterilizers 383
Microtomes 383
The Ovens 384
Laboratory Floors 384
The Hoods 384
Laboratory Sinks 384
Test-tube Board 385
Tables and Benches 386
Laboratory Paint 386
Slide Cases 386
Laboratory Lighting 387
The Dark Room 387
Postmortem Room 387
Postmortem Table 388
The Animal Rooms 388
Frozen Section Work 389
The Museum 390
The Refrigerators 390
Pathology for Small Hospitals 390
Department of Hydrotherapy 392
History of the Science 392
The Douche 394
The Nauheim 394
Dry and Vapor Heat 394
Passive Exercises 395
Massage 396
Equipment 396
Control Table 397
Needle and Shower 399
The Hospital Pharmacy 400
Equipment of Drug Store 400

OPERATION OF THE HOSPITAL (*Continued*) PAGE
The Bottles and Labels ... 402
Ward Cabinets ... 402
Methods of Dispensing ... 404
Hospital Dietetics ... 405
Science of Special Feeding ... 406
Chemistry of Foods ... 406
Caloric Values in Diets ... 406
The Diet Kitchen ... 407
Charting Special Diets ... 408
Common Diet Lists ... 409
Diets in Small Hospitals ... 411
Milk in the Hospital ... 412
Sources of Supply ... 412
Treatment of Milk ... 413
Certified Milk ... 414
Milk for Children ... 415
Sterilized Milks ... 415
Milk Formulas ... 415
The Milk Laboratory ... 419
The Work Table ... 420
The Peptonizer ... 421
The Commercial Milk ... 422
Checking Systems ... 423
Isolation and Disinfection ... 425
Diseases of Childhood ... 426
The Examining Rooms ... 426
Care of the Exposed ... 427
Complete Isolation ... 428
Raising the Quarantine ... 429
The Isolatable Diseases ... 430
Tuberculosis and Pneumonia ... 430
Typhoid Fever ... 431
Erysipelas ... 432
Cerebrospinal Meningitis ... 433
Gonorrhea ... 433
Syphilis ... 434
Pyocyaneus ... 435
Pyogenic Infections ... 435
Other Pyogenic Organisms ... 435
Processes of Disinfection ... 436
Heat ... 436
Fluids ... 436
Chemical Agents ... 437
Gases ... 438
Model Isolation Unit ... 440
The *x*-Ray Department ... 446
Equipment ... 447
Portable Apparatus ... 448
Stereoscopic Apparatus ... 449
Protective Devices ... 450
Plans of the *X*-Ray Suite ... 452
Patients' Records and Record Keeping ... 453
History Taking ... 454
Laboratory Routine ... 457
Physical Examination ... 462
Daily Record ... 463
Nursing Chart ... 463
Permit for Operation ... 464
History of Operation ... 465
Filing and Indexing ... 467
Who Shall Have Access to Records? ... 471
X-Ray Record ... 473
Who Shall Have Access to *X*-Ray Plates? ... 475
Social Service and Outpatient Work ... 477
Organized Charities ... 477
The Dispensary ... 479
Outpatient Hospital Service ... 481
Parole of Children ... 482

OPERATION OF THE HOSPITAL (*Continued*) PAGE

Business Management ... 484
The Office ... 484
Admission of Patients ... 485
The Room Board ... 488
Disposition of Effects ... 489
Hospital Visitors ... 490
To Private Patients ... 491
In Large Wards ... 491
Visitors in Maternity ... 492
Visitors to Children's Section ... 494
Social Visits of Physicians ... 495
Devices for Handling Visitors ... 496
The Hospital Telephone ... 498
Physicians' Register ... 499
The Condition Book ... 500
Intern Call Systems ... 502
The Key Board ... 502
Repairs in the Hospital ... 503
Disposition of the Dead ... 504
Effects of the Dead ... 505
Papers to Certify ... 506
Obtaining Autopsies ... 507
Ambulance Service ... 508
The Horse Vehicle ... 508
The Auto Ambulance ... 509
Comparative Costs ... 509
Hospital Accounting ... 511
Income ... 511
Expenditures ... 514
General Accounts ... 518
Investment Accounts ... 518
Insurance ... 521
Analysis of Expenditures Book ... 522
Balance Sheet ... 524
Petty Cash Book ... 527
House Count ... 528
Superintendent's Report ... 531
Financial and Statistical Statement ... 533
Purchase of Supplies ... 535
Requisitions ... 536
The Storekeeper ... 537
Medical and Surgical Supplies ... 539
Gauze and Cotton ... 539
Linens and Cottons ... 541
Blankets ... 542
Coats, Gowns, Uniforms ... 543
Enamel Ware ... 545
Irrigators and Glassware ... 546
Miscellaneous Rubber Goods ... 547
Sheets and Blankets ... 547
Other Rubber Supplies ... 548
Consumable Supplies ... 550
Meat and Fish ... 550
Eggs ... 554
Butter ... 556
Fresh Fruits ... 558
Root Vegetables ... 560
Canned Vegetables ... 562
Canned Fruits ... 565
Olives ... 566
Coffee ... 566
Cooking and Kitchen Ware ... 568
Granite Ware ... 568
Enamel Ware ... 569
Tinned Steel ... 569
Copper Ware ... 569
Aluminum ... 569
Cutlery and Table Ware ... 570
China and Glassware ... 572

OPERATION OF THE HOSPITAL (*Continued*) PAGE
Soaps ... 573
Janitors' Supplies ... 577
Housekeeping Department ... 580
The Housekeeper ... 580
Feeding the Hospital ... 582
Kitchen Operations ... 582
Divisions of Table Service ... 585
Menus for the Help ... 586
Menus for Patients ... 586
Feeding the Small Hospital ... 589
Cost of Private versus Charity Patients ... 591
Employment of the Help ... 592
The Trained Help ... 593
The Common Help ... 594
Cleaning the Hospital ... 596
Institution Laundry ... 598
Laundry Problems ... 599
Capacity of the Laundry ... 601
Laundry Machinery ... 603
Laundry Space ... 607
Laundry Rules ... 608
Laundry Costs ... 611
Handling the Linens ... 612
Steam, Water, and Power ... 615
The Installation ... 616
The Linen Rooms ... 621
Laundry Chutes ... 624
Destruction of Waste ... 626
Sanitary Garbage Destroyer ... 627
Combination Garbage Plant ... 629
The Institution Bakery ... 631
Cost of Home-made Bread ... 631
Equipment of Home Bakery ... 631
Cost of Bakers' Bread ... 632

INDEX ... 633

INTRODUCTION

PROBLEMS incident to the creation and operation of institutions intended for the care of the sick are practically the same whether the object be a sanitarium, an asylum for the mentally diseased, a home for the helpless, old or young, or a general or special hospital.

Communities, like individuals, inevitably reach a parting of the ways in the course of their lives and adventures, and one of two things must happen: either they warp, shrivel up and stagnate in development and eventually become social defectives, to live on the bounty of others; or they grow to strong, virile maturity that brings with it those responsibilities that have for their object the care and guardianship of the unfortunate and helpless. When such an epoch comes in the life of a community, the stimulus is usually a present and a pressing necessity. The inspiration behind the demand will be the same no matter what class of institution is required—the growing community and the increasing number of people intended to be benefited, the distance to the nearest institution of the same nature that has been utilized in the past, the present ability of the community to bear the new burden independent of outsiders—all these questions present themselves when such new philanthropic enterprises are contemplated.

Usually, the first necessity will be for a general hospital to care for and cure the vast majority of diseases; and so great and varied and many sided is this question that in its investigation we will naturally come upon many side questions, which would likewise arise in the event that some special institution was under discussion, and, therefore, it may be profitable for us to diverge occasionally and follow some of these by-paths of thought to their logical end.

THE GENERAL HOSPITAL

General hospitals divide themselves automatically into three classes: first, those that are wholly charitable in their good office; second, those that are partly given over to charity and partly to pay patients; third, those that accept only pay patients.

In nearly every part of the world hospitals that do charity work only are supported by the organized public—that is, either by the state or the municipality; in such institutions the very poorest class, composed of people who are permanent charges upon society, are cared for, and in these the primary demand, at least in the past, has been in the direction of economy in operation. That such a policy is a mistaken one, and not in conformity with modern civilization and philanthrophy, needs no argument.

Hospitals that do a considerable amount of charity, and at the same time provide accommodation for a certain proportion of private pay patients, occupy a vastly different plane in society from those that do only charity work. Their contemplation brings us to a more inviting field. These establishments must have their initiative and make up their deficits from one or several sources; sometimes

OPERATION OF THE HOSPITAL (*Continued*) PAGE
The Bottles and Labels 402
Ward Cabinets 402
Methods of Dispensing 404
Hospital Dietetics 405
Science of Special Feeding 406
Chemistry of Foods 406
Caloric Values in Diets 406
The Diet Kitchen 407
Charting Special Diets 408
Common Diet Lists 409
Diets in Small Hospitals 411
Milk in the Hospital 412
Sources of Supply 412
Treatment of Milk 413
Certified Milk 414
Milk for Children 415
Sterilized Milks 415
Milk Formulas 415
The Milk Laboratory 419
The Work Table 420
The Peptonizer 421
The Commercial Milk 422
Checking Systems 423
Isolation and Disinfection 425
Diseases of Childhood 426
The Examining Rooms 426
Care of the Exposed 427
Complete Isolation 428
Raising the Quarantine 429
The Isolatable Diseases 430
Tuberculosis and Pneumonia 430
Typhoid Fever 431
Erysipelas 432
Cerebrospinal Meningitis 433
Gonorrhea 433
Syphilis 434
Pyocyaneus 435
Pyogenic Infections 435
Other Pyogenic Organisms 435
Processes of Disinfection 436
Heat 436
Fluids 436
Chemical Agents 437
Gases 438
Model Isolation Unit 440
The *x*-Ray Department 446
Equipment 447
Portable Apparatus 448
Stereoscopic Apparatus 449
Protective Devices 450
Plans of the *X*-Ray Suite 452
Patients' Records and Record Keeping 453
History Taking 454
Laboratory Routine 457
Physical Examination 462
Daily Record 463
Nursing Chart 463
Permit for Operation 464
History of Operation 465
Filing and Indexing 467
Who Shall Have Access to Records? 471
X-Ray Record 473
Who Shall Have Access to *X*-Ray Plates? 475
Social Service and Outpatient Work 477
Organized Charities 477
The Dispensary 479
Outpatient Hospital Service 481
Parole of Children 482

OPERATION OF THE HOSPITAL (*Continued*) PAGE

Business Management ... 484
The Office ... 484
Admission of Patients ... 485
The Room Board ... 488
Disposition of Effects ... 489
Hospital Visitors ... 490
To Private Patients ... 491
In Large Wards ... 491
Visitors in Maternity ... 492
Visitors to Children's Section ... 494
Social Visits of Physicians ... 495
Devices for Handling Visitors ... 496
The Hospital Telephone ... 498
Physicians' Register ... 499
The Condition Book ... 500
Intern Call Systems ... 502
The Key Board ... 502
Repairs in the Hospital ... 503
Disposition of the Dead ... 504
Effects of the Dead ... 505
Papers to Certify ... 506
Obtaining Autopsies ... 507
Ambulance Service ... 508
The Horse Vehicle ... 508
The Auto Ambulance ... 509
Comparative Costs ... 509
Hospital Accounting ... 511
Income ... 511
Expenditures ... 514
General Accounts ... 518
Investment Accounts ... 518
Insurance ... 521
Analysis of Expenditures Book ... 522
Balance Sheet ... 524
Petty Cash Book ... 527
House Count ... 528
Superintendent's Report ... 531
Financial and Statistical Statement ... 533
Purchase of Supplies ... 535
Requisitions ... 536
The Storekeeper ... 537
Medical and Surgical Supplies ... 539
Gauze and Cotton ... 539
Linens and Cottons ... 541
Blankets ... 542
Coats, Gowns, Uniforms ... 543
Enamel Ware ... 545
Irrigators and Glassware ... 546
Miscellaneous Rubber Goods ... 547
Sheets and Blankets ... 547
Other Rubber Supplies ... 548
Consumable Supplies ... 550
Meat and Fish ... 550
Eggs ... 554
Butter ... 556
Fresh Fruits ... 558
Root Vegetables ... 560
Canned Vegetables ... 562
Canned Fruits ... 565
Olives ... 566
Coffee ... 566
Cooking and Kitchen Ware ... 568
Granite Ware ... 568
Enamel Ware ... 569
Tinned Steel ... 569
Copper Ware ... 569
Aluminum ... 569
Cutlery and Table Ware ... 570
China and Glassware ... 572

OPERATION OF THE HOSPITAL (*Continued*) PAGE
Soaps ... 573
Janitors' Supplies ... 577
Housekeeping Department ... 580
The Housekeeper ... 580
Feeding the Hospital ... 582
Kitchen Operations ... 582
Divisions of Table Service ... 585
Menus for the Help ... 586
Menus for Patients ... 586
Feeding the Small Hospital ... 589
Cost of Private versus Charity Patients ... 591
Employment of the Help ... 592
The Trained Help ... 593
The Common Help ... 594
Cleaning the Hospital ... 596
Institution Laundry ... 598
Laundry Problems ... 599
Capacity of the Laundry ... 601
Laundry Machinery ... 603
Laundry Space ... 607
Laundry Rules ... 608
Laundry Costs ... 611
Handling the Linens ... 612
Steam, Water, and Power ... 615
The Installation ... 616
The Linen Rooms ... 621
Laundry Chutes ... 624
Destruction of Waste ... 626
Sanitary Garbage Destroyer ... 627
Combination Garbage Plant ... 629
The Institution Bakery ... 631
Cost of Home-made Bread ... 631
Equipment of Home Bakery ... 631
Cost of Bakers' Bread ... 632

INDEX ... 633

INTRODUCTION

PROBLEMS incident to the creation and operation of institutions intended for the care of the sick are practically the same whether the object be a sanitarium, an asylum for the mentally diseased, a home for the helpless, old or young, or a general or special hospital.

Communities, like individuals, inevitably reach a parting of the ways in the course of their lives and adventures, and one of two things must happen: either they warp, shrivel up and stagnate in development and eventually become social defectives, to live on the bounty of others; or they grow to strong, virile maturity that brings with it those responsibilities that have for their object the care and guardianship of the unfortunate and helpless. When such an epoch comes in the life of a community, the stimulus is usually a present and a pressing necessity. The inspiration behind the demand will be the same no matter what class of institution is required—the growing community and the increasing number of people intended to be benefited, the distance to the nearest institution of the same nature that has been utilized in the past, the present ability of the community to bear the new burden independent of outsiders—all these questions present themselves when such new philanthropic enterprises are contemplated.

Usually, the first necessity will be for a general hospital to care for and cure the vast majority of diseases; and so great and varied and many sided is this question that in its investigation we will naturally come upon many side questions, which would likewise arise in the event that some special institution was under discussion, and, therefore, it may be profitable for us to diverge occasionally and follow some of these by-paths of thought to their logical end.

THE GENERAL HOSPITAL

General hospitals divide themselves automatically into three classes: first, those that are wholly charitable in their good office; second, those that are partly given over to charity and partly to pay patients; third, those that accept only pay patients.

In nearly every part of the world hospitals that do charity work only are supported by the organized public—that is, either by the state or the municipality; in such institutions the very poorest class, composed of people who are permanent charges upon society, are cared for, and in these the primary demand, at least in the past, has been in the direction of economy in operation. That such a policy is a mistaken one, and not in conformity with modern civilization and philanthrophy, needs no argument.

Hospitals that do a considerable amount of charity, and at the same time provide accommodation for a certain proportion of private pay patients, occupy a vastly different plane in society from those that do only charity work. Their contemplation brings us to a more inviting field. These establishments must have their initiative and make up their deficits from one or several sources; sometimes

the institution will be created and supported in large part by a peculiarly fortunate member of the community who has the necessary wealth at his disposal, coupled with a philanthropic mind. Frequently a religious order, a church organization, may inaugurate the movement for such a hospital, and rally to its support for the success of the enterprise a sufficient number of adherents of the faith to guarantee the creation and support of the institution. Oftentimes the movement is a racial one, and the first thought in the conduct of such a hospital will be the care of the particular transplanted race that has inaugurated the movement and made possible its achievement. Again, the inspiration may be independent of any special faction or class or creed, and where public subscriptions behind a stimulus of good citizenship will build the hospital and afterward supply a large measure of its support.

Occasionally an institution founded by one of these classes in the community will diverge, owing to changed conditions, and become the particular philanthrophy of an entirely different class; as, for example, a hospital instituted and supported for a length of time by public subscriptions may be the recipient of a large individual gift in the shape of an endowment or bequest, oftentimes carrying with it certain conditions which may change the whole character of the institution.

Now let us consider a hospital inaugurated with some ulterior purpose in view and intended to be self-supporting from charges against pay patients. Very often this class of institution will have its birth in the business acumen of one or a coterie of physicians who have in mind a better care for their patients than can be given in some already existing institution, in which part of the support may come from free gifts on the part of the public. Many times such an establishment results from the concerted action of well-to-do people of the community, where there is already in existence a charity hospital having no accommodation for those who can afford to pay for their care.

THE CHARITY HOSPITAL

There are some advantages and many disadvantages, taking a broad viewpoint, in all three classes of institutions which we have named.

Regarding charity hospitals there is too commonly an impression in the public mind that, since the patients to be benefited are public charges, contributing no part toward their support, almost anything is good enough for them; a place to be housed —without much regard to the kind of housing; indifferent medical attention; more indifferent nursing; the cheapest food; the most rudimentary and often obsolete methods of treatment—these seem too often to meet the requirements of even enlightened, self-satisfied communities. These disadvantages in the public charity hospital are overcome almost wholly, when they are overcome at all, by an aroused public conscience—as, for instance, within the past few years in some American communities, where charity boards, state officials, and municipal commissions have been arraigned before the bar of public opinion, and even in the courts of law, for wanton neglect of their obligations toward the helpless charges committed to their care. So great indeed seems to be the change in the public mind within recent years, that it is certain the day is not far distant when the public hospital will become an object of pride to society, where the poor will have the same advantages in the treatment and cure of disease as private patients in more exclusive institutions; indeed, it may be frankly stated that there are even now, thanks to this aroused public conscience, some institutions in several of the states of the American union to which even well-to-do people seek admission, because of the high order

of administration and of their humane and modern methods. The insane asylums stand out boldly as examples of this new era of our civilization, owing somewhat, perhaps, to the peculiarly helpless condition of the wards of the public and the sympathy aroused in their behalf.

MIXED HOSPITALS

The quasi-public hospitals, which provide a part of their service for charity and another for those who can afford to pay, have also their advantages and disadvantages.

Naturally, the private patients will come to these institutions by election, and, therefore, the service received must be of a sufficiently high order to attract them; thus, this part of the question will take care of itself, in a general way.

The charity patient will not always fare so well. Here, too, in late years the public conscience has been aroused and in rather a unique way:

The time is past when administrators of such an institution can go to the public and command support on the score of duty and good citizenship. Charity givers and philanthropists of large means are usually men and women, who, having succeeded in their business life by reason of mental superiority and discriminating methods, are apt to ask embarrassing questions on being approached for donations; statistical reports of stewardship, setting out in detail the disposition of funds employed in the past will be required. It will not do any longer to appeal to the wealthy for donations on the score that the institution has been run during the past year at a low per-capita cost, because the discriminating philanthropist will pry beneath these figures to ascertain what has been done in a humanitarian way as measured by the medical skill and possibilities of the time. Modern thought along these lines has been a vast advantage in these mixed hospitals, compelling administrators to give to the free patient a higher order of service and a better scientific care than formerly.

THE PRIVATE HOSPITAL

The private hospital of the day, in which all of the patients are expected to pay in full for the care they receive, is one of the most interesting public problems of the time. It is dependent for its prosperity on the number of patients attracted, and this brings about a healthy competition in service and care. Usually, the physician is responsible for the patient's entry into the institution. If the doctor is financially interested in the establishment, he is certain to be even more interested from a financial standpoint in the proper care of his patient, and, however much he may desire to support the institution where his investment lies, he will rarely be willing to do so at the expense of his own standing with his patient and his patient's family; and even if we are willing to endow the doctor with the most sordid and selfish motives, we must yet give him credit for a certain business judgment, which will coerce him into a demand for the very best scientific care of his patient.

In a very large way we can look to this class of hospitals for new standards, for the latest scientific methods in the treatment of disease, for the highest order of technical skill. If, moreover, all these are found in one hospital, and for a favored class, it will not be very long before the public will demand their introduction in the care of less fortunate patients, and in this wise the community will gain for its public charges the same standards in force in behalf of the more fortunate of its members.

THE CHARACTER OF THE HOSPITAL

We have now considered some of the underlying thoughts which will move a community to build or propose to build a hospital, and which will probably lead to the particular kind of hospital demanded. But there are other considerations, local in character, which must be reckoned with. It may be a mining community, in which the vast majority of the people are in moderate circumstances with fixed incomes, small, but constant; a milling neighborhood, where the conditions would be practically the same; again, it may be the site of railroad shops or shipyards; here the kind of hospital will be decided upon by the employers of the labor, the corporations.

Local conditions leading to certain classes of diseases will frequently determine the character, as, for example, where lung troubles and the catarrhal affections are most frequent; or, in the south, where the micro-organisms of malaria have their abiding place; or a region of mountain fevers, or in those low, humid areas where the gastro-intestinal diseases are common. If it be some port of entry where foreigners come and go, and where the communicable infections are likely to prevail, isolation is a prerequisite.

In a railroad town where the hospital is to be built for the accommodation of railroad men, perhaps to be built and supported by the railroad corporation itself, the question is rather an easy one, and perhaps of the simplest form. Surgical wards for injured men, medical wards for sick railroad employees, and it may be a genito-urinary department, will meet almost all the requirements. If it is a milling town, where the men work among iron or steel filings, or in an atmosphere filled with wool and cotton particles or charged with noxious gases, there must be special departments for the eye, ear, nose, and throat.

When the hospital is to be located where the employed men reside, the further question naturally presents itself, is it intended to take care of the families of the workmen, and if so, is it to be done free of charge or for a modest sum? It will then be necessary to include wards for the women, not only for those sick with ordinary afflictions, but with special women's diseases. As it is coming nowadays to be a necessity for women to retire to a hospital for their maternity, an obstetric department will be needed.

Not only the ordinary diseases of children must be considered, but malnutrition, which brings in its wake provision for their diet, either in the shape of wet-nurses, milch-goats, healthy cows, kept and milked in a sanitary way, or some form of prepared milk food. For the communicable diseases of childhood isolation wards must be supplied.

FINANCING THE HOSPITAL

Having considered somewhat the character and the size of the hospital most needed, out next thought, and certainly the most important one, has to do with the raising of money to build the institution and to provide for its permanent support. We must revert again to our previous classification of general hospitals. The charity hospital, pure and simple, will necessarily be financed by the political body inaugurating it—that is, the legislative assembly will appropriate the money to build it, with at least an implied obligation to appropriate annually thereafter the necessary funds for its support. We need only say a few words in this behalf. Until very recently public hospitals have been miserably provided for, and it is within common knowledge that the administrator even now held highest in the esteem of the appointive power is he who has been able to operate his institution

for the least money, without much regard to the character of the service given to the patients. The administrator, having received definite orders from his masters, the public, has merely obeyed these commands and operated his institution in the manner required. It has not been his fault if the orders have been mediæval and if the policies transmitted are unhumane, unenlightened, unscientific, and even inhuman. If legislators have demanded such an administration, they again have merely taken their orders from the public which has elected them to office and continues them in office only so long as they do the public bidding. If public hospitals are to be administered in step with the scientific tone of the time, and if the wards of the public are to have the scientific skill in the cure of their diseases to which they are entitled by reason of the modern status of medicine and surgery, the orders must come direct from the public conscience, as expressed in a determination for larger appropriations for these institutions. There is rarely a protest if the salaries of politicians are increased, or if new offices are created or new public buildings proposed. But one who may have the curiosity to consult the legislative annals in any given state, over a long period of time, will find that to-day, notwithstanding the increased cost of everything in the way of living, the amounts of money appropriated for public institutions are about the same as many years ago, and administrators are expected to operate their institutions within those limited means. A proposal from a governor or mayor or legislator for an increase in appropriations for a public institution is usually met with the cry of graft, the inference being that political henchmen are to be fed at the public crib. And so the proposal dies away, and so it will continue to die away until the public recognizes that the hospital of to-day cannot be operated upon the same standards and with the same simplicity that obtained twenty years or even ten years ago. And when that time comes, public hospitals will not be the disgrace they are to-day.

Let us turn now to a more attractive and inviting field of speculation, the financing of another class of general hospitals, the one inaugurated by private enterprise, by philanthropy and private charity combined. There a proportion of the patients is treated free and another proportion, large or small, is supplied with accommodations for which they must pay. We ought, perhaps, to set out upon this discussion with the flat declaration that no institution that proposes to take care of any considerable percentage of its patients free can be self-supporting. In other words, the pay patients of an institution should not be compelled to do more than pay for their own care. They should not be coerced into helping pay the expenses of others. That money should come by voluntary contribution, which is not the case when a private patient is charged for the service he receives more than it costs. When we think of a part pay and part free hospital, we must settle definitely the number of free patients to be provided for and then figure upon financing the institution for that many free patients, leaving the private work in the hospital to merely take care of itself.

In the first place, the institution must be planned along the lines of our previous discussion; and then the money must be raised with which to build it, since no part of the building fund is at hand from any private patients to be received. Later on we shall discuss the major items of expense in building the hospital; at this time we are concerned only with its subsequent support and with methods for raising the money required to build it. Of these there are a number. Naturally, the easiest and most satisfactory is by direct gift from some wealthy member of the community, or from some wealthy philanthropist whose interests are there. Such a donation may be direct, during his lifetime and under conditions which he himself may dictate, and in two parts, one for the building of the institution and

one for its subsequent support; or it may come in his will by bequest. In this case the restrictions usually intended by the giver will give direction to the subsequent character and conduct of the institution.

The next best method of raising funds for the building and support of the hospital or similar institution will be by way of some organized body of citizens, preferably a body having a corporate and, therefore, permanent, existence, a church organization, or one or another of the religious orders having some binding issue, such as the religious thought, as its moving purpose. Such initiative has many advantages and some disadvantages. The cohesive power is great in a church or religious organization and is not likely to be lost in the passage of time, and, therefore, support pledged to-day to a hospital in the community will not be lost unless for excellent reasons. And usually an organization with such a serious purpose has certain ideals and certain standards which will be infused into any creature to which it gives birth. There is no greater human motive than the religious impulse, and the adherents of a faith will rally round a standard set by their leaders, and therefore a hospital instituted under such auspices is likely to be permanently supported, and to that extent such support has its advantage. Unfortunately, we occasionally find such religious thought not quite abreast of the day from the medical and surgical standpoint, and it is possible for a hospital operated by a religious society or the leaders of a religious sect to fall somewhat short of the scientific requirements of the time; but usually this tendency is combated and overcome by a secondary leadership or a demand which may emanate from the medical staff or the lay members of the sect, and which will serve to keep the institution up to present-day standards.

Another form of support for an institution of this character will be rather racial than sectarian. Next to the religious motive there is hardly an impulse that moves the heart so completely as that of love of country. In some communities there are large numbers of transplanted foreigners from a land beyond the seas, and, far from home, they oftentimes are somewhat clannish, as expressed in a desire of some members to help the less fortunate. There are German hospitals and French hospitals and Scandinavian hospitals. Usually such support will be almost community wide, and the support of the hospital will be in proportion to the strength of the race in the community, and in any event is likely to be earnest, permanent, and as generous as the institution deserves.

Then there is the way of independent subscriptions taken from individuals indiscriminately. This is the least desirable and the most hazardous support an institution can have. The fortunes of the givers may change; there is no rallying ground and no common standards upon which such an institution can be operated, because of the diversity of opinion and the diversity of interests of the givers; so that it may well come to pass that a large giver to such an institution may become dissatisfied with the policies and standards upon which it is conducted, and failing to change these to suit himself his subscriptions may be withdrawn.

For the support of Catholic institutions, the clergy, the various orders of monks, and the sisterhoods can appeal to contributors from the religious side. These religious orders have their ideals and their institutions will be conducted in step with these ideals, so that there is something very definite upon which the institution can be founded, and whatever the weaknesses may be in such hospitals there will be no contending factions, only one set of morals, one set of ideals, and the institution will be maintained along one single rigid line of conduct. Not always are these holy people broad-minded. They have few opportunities to see life in its broadest side. But their economies will be great and their humanities

form and has met with abuses, as, for instance, in one of the states, institutions that are fortunate in their political affiliations are granted lump sums in the state's annual appropriations, irrespective of the actual number of patients cared for in them. Undoubtedly the per capita allowance system of auxiliary support will, in the near future, become country-wide and will settle down in its details to a rational and equitable basis.

This system is in vogue in a few of the cities of this country, and it seems to operate about in the same way as state aid. In Canada there is a disposition to enlarge upon this idea, and to encourage the building of quasi-public institutions by private charity. In a few places, notably Winnipeg, the city authorities have entered into contract with the hospital for the care of pauper patients to an agreed extent and at definite rates extending over fixed periods of time, thus insuring the institution against a burden greater than it can bear.

In some sections of the country the so-called "Saturday and Sunday collections" make up a very consequential fund to be divided among certain institutions. Too often these collections are committed to the discretion of persons who favor certain institutions, and thus the funds are not always divided upon as just a basis as could be desired, but that, too, will be cured in time.

The so-called "Tag Day" innovation is in the same class, but this has already won for itself the general opprobrium of the public because it has been allowed to fall to the level of the now obsolete strawberry festival, where one had to run the gauntlet of women who knew no limit to their insistence and who excused themselves for indecent solicitation on the score that it was "in a good cause."

And, then, there are the individual gifts to institutions—outright donations by the living and bequests in the wills of the dead. While such gifts are uncertain and never to be counted on, there are certain peculiar features attached to them to which allusion ought to be made. In years gone by it was the custom for the people able to give to make their occasional donations, large or small, to the institutions appended to their churches or their favorite societies, and donors were not, as a rule, very exacting in their demands as to how their money was to be employed. This indifference is very rapidly giving way, perhaps as a part of our more accurate commercial sense, to a demand for detailed reports of stewardship. This means that in the future donations of this individual sort, in order to be received, must be deserved. It will not do any longer to present to a prospective giver a pamphlet of an institution containing a few glittering generalities and much self-praise. If the annual report of the institution sets out that the per capita cost of caring for patients during the past year was $2, the prospective giver will want to know what became of that $2; it will be no answer to say that this $2 was 50 cents less than the amount expended per capita in some other institution. Details are wanted: Have the patients been properly housed in sanitary, well-ventilated, and clean rooms and wards? Have they had the benefits of modern medical and surgical appliances in the treatment of their diseases? Was there an adequate dietetic competently carried out under the orders of medical men well versed in the laws of metabolism, nutrition, waste? Did the surgical patients have the advantages of modern asepsis in the operating- and dressing-rooms and in the details that go to make these rooms efficient? Did they have the benefits of modern *x*-ray appliances and electrical apparatus? What about their pathology as aid to the diagnosis of disease—the urinology, bacteriology, surgical pathology, serum and vaccine therapy? No institution should be permitted to exist in this modern day of science unless its administrators have at least shown an appreciation of these scientific necessities of the time.

Of course, there are drawbacks and hazards in this form of support, and there are dangers threatening this kind of organized charity. In the first place there are many people who have very decided views as to the direction they want their charity to assume. One person may be attracted toward a children's charity; another may wish his or her money to be expended in the care of a maternity hospital, while still another will prefer, for sentimental reasons, to give for the benefit of orphans, or for unfortunate girls, or for some other very special purpose. To these classes a great, all-embracing charity will not particularly appeal, and it may not satisfy them at all. To this extent such an association will fail to attract some support that would be well worth having.

Then, also, there is danger of overloading such an association. One or a few very active and philanthropic persons may inaugurate some special charity, run it at their own expense for a time, then undertake to load it on the association. The charity itself may be a most worthy one, but may prove the proverbial straw to overload the association; and in any event it will open the way to similar demands and make a precedent not easily brought to a check when necessary.

But to the author's mind there is another factor in this association form of charity that ought to be reckoned with at the very outset. Naturally, the organizers of such an association will want to look a long way ahead for breakers, and to discern the clear sailing waters of permanency and safety. They will most likely want to provide against a rainy day, if the metaphor may be changed, by influencing the gifts of large funds by way of bequests and legacy. Shall such gifts be made to the individual charities or to the association? Are association officers warranted in asking the subsidiary charities to pool their gifts into the common fund without any conditions of reversion, or may each charity accept whatever is offered, the interest to be used for the institution's benefit, and the principal to be controlled by its own board? And will such pooling serve eventually to rob the individual charities of their sentiment, and take away that personal thing so necessary if a board of directors is to do the greatest amount of good to a chosen class? It looks to the author like such an association could well become so big eventually that it could afford to devote its funds toward the prevention of poverty, or at least pauperism, by inaugurating works that would tend to take the beneficiaries out of the pauper class and place them in the class of self-supporters. In such a case the charity would have ended and a business régime would have begun. Again, the association officers or trustees might grow cold toward certain charities very dear to the hearts of those who had given money for their permanent support.

If the association were established in a policy which did not permit it to accept other than annual subscriptions, and if the individual charities were put on their mettle to acquire permanent endowments to make them as nearly self-supporting as possible, there would be much nearer a survival of the fittest in the stretch of years, and it would seem to be a better arrangement all round.

Additional Support of Quasi-public Institutions.—We have now discussed, at least, the more desirable forms of primary support for these community institutions. There are oftentimes very material resources from one direction or another that will serve to make up any deficiency with which they may be threatened or that they may actually face. Perhaps one of the surest of these is a form of state aid of recent birth, especially in some of the eastern states. This support takes the form of a per capita allowance to the various recognized hospitals and asylums for all patients cared for, who would otherwise be direct charges on the public and who would have to be cared for in state or county or municipal institutions. Like most new efforts, this plan has not yet assumed the best attainable

form and has met with abuses, as, for instance, in one of the states, institutions that are fortunate in their political affiliations are granted lump sums in the state's annual appropriations, irrespective of the actual number of patients cared for in them. Undoubtedly the per capita allowance system of auxiliary support will, in the near future, become country-wide and will settle down in its details to a rational and equitable basis.

This system is in vogue in a few of the cities of this country, and it seems to operate about in the same way as state aid. In Canada there is a disposition to enlarge upon this idea, and to encourage the building of quasi-public institutions by private charity. In a few places, notably Winnipeg, the city authorities have entered into contract with the hospital for the care of pauper patients to an agreed extent and at definite rates extending over fixed periods of time, thus insuring the institution against a burden greater than it can bear.

In some sections of the country the so-called "Saturday and Sunday collections" make up a very consequential fund to be divided among certain institutions. Too often these collections are committed to the discretion of persons who favor certain institutions, and thus the funds are not always divided upon as just a basis as could be desired, but that, too, will be cured in time.

The so-called "Tag Day" innovation is in the same class, but this has already won for itself the general opprobrium of the public because it has been allowed to fall to the level of the now obsolete strawberry festival, where one had to run the gauntlet of women who knew no limit to their insistence and who excused themselves for indecent solicitation on the score that it was "in a good cause."

And, then, there are the individual gifts to institutions—outright donations by the living and bequests in the wills of the dead. While such gifts are uncertain and never to be counted on, there are certain peculiar features attached to them to which allusion ought to be made. In years gone by it was the custom for the people able to give to make their occasional donations, large or small, to the institutions appended to their churches or their favorite societies, and donors were not, as a rule, very exacting in their demands as to how their money was to be employed. This indifference is very rapidly giving way, perhaps as a part of our more accurate commercial sense, to a demand for detailed reports of stewardship. This means that in the future donations of this individual sort, in order to be received, must be deserved. It will not do any longer to present to a prospective giver a pamphlet of an institution containing a few glittering generalities and much self-praise. If the annual report of the institution sets out that the per capita cost of caring for patients during the past year was $2, the prospective giver will want to know what became of that $2; it will be no answer to say that this $2 was 50 cents less than the amount expended per capita in some other institution. Details are wanted: Have the patients been properly housed in sanitary, well-ventilated, and clean rooms and wards? Have they had the benefits of modern medical and surgical appliances in the treatment of their diseases? Was there an adequate dietetic competently carried out under the orders of medical men well versed in the laws of metabolism, nutrition, waste? Did the surgical patients have the advantages of modern asepsis in the operating- and dressing-rooms and in the details that go to make these rooms efficient? Did they have the benefits of modern *x*-ray appliances and electrical apparatus? What about their pathology as aid to the diagnosis of disease—the urinology, bacteriology, surgical pathology, serum and vaccine therapy? No institution should be permitted to exist in this modern day of science unless its administrators have at least shown an appreciation of these scientific necessities of the time.

Such demands as these, if insisted upon, may seem exacting and even cruel, but would it not be better to have fewer institutions, and larger and better ones, that can make a wiser use of philanthropic funds for the adequate scientific care and cure of sick people, than to have many and irregular and inefficient hospitals and asylums? Many years ago—and not so very many years ago, either—good hospital care would be satisfied with a clean bed in a clean ward, practical but untrained nursing, a good doctor to prescribe plenty of medicine. This description will not satisfy for an up-to-date modern hospital.

Additional Support from Special Charges.—It is unfortunate, but true, that in most quasi-public hospitals and similar institutions the administrators rely for a considerable proportion of their support on special charges against patients in the institution. The insistence that there ought not to be any special charges of any kind against any class of patients in any institution will be strongly criticized. And yet let us see if this position is not well taken: When we accept a patient in a hospital or sanitarium or asylum or in any institution where a cure is to be attempted, the patient comes to the institution with at least an implied guarantee that he will get the best the institution has to give. If he is a pay patient, we have accepted his money on those terms, no matter how much or how little he pays. If he is a free patient, we have accepted funds from some source, and in accepting those funds have guaranteed, at least by inference, to give patients the best attention of which modern science and modern humanity are capable. If we withhold from him the service of the laboratory of pathology to aid his doctor in the diagnosis of his disease, because he cannot pay for such service, we have been guilty of gross deception to that patient or to the donors of the funds supposed to have been given for his care. If we decline to take an *x*-ray picture of a broken bone because the patient cannot pay for it, we have refused him one of the most necessary aids to his cure. If we have failed to give him the benefits of the modern laws of dietetics, as expressed in his food, we have deprived him of one of the fundamental factors in modern therapy.

These thoughts may be construed as Utopian, since even to-day in nearly every quasi-public institution in this country extra charges are made for these services. But they will not remain Utopian, and a time is coming, and shortly, when the acceptance of a patient will carry with it an obligation to furnish, on the terms of admission, every known and approved scientific aid for the diagnosis and treatment of the disease or injury.

But while such charges for special service dominate the administration of almost every institution, we shall perhaps have to recognize them and bow to them until a better day comes; and, therefore, we shall have to analyze these extra charges, and will take occasion to do so from time to time as we proceed, under the correct headings; for instance, we will discuss the cost of feeding free patients as against the cost of feeding pay patients; we shall take account of the cost of producing *x*-ray pictures and their uses and limitations, and we shall discuss the cost of various forms of pathologic work as they come up in order under the general headings of pathology in hospitals.

Classified Hospital Expenditures.—The natural sequence of thought, if we are to contemplate the establishment of a public or semipublic institution in a community, is to work from the demand toward the accomplishment; that is, we have the demand for a specific institution, and we have now to look somewhat to satisfying it, the kind and scope of the institution required, and we have taken the measure of the avenues of support upon which we may count. But we have not yet taken into account the amount of support required, nor the

various channels against which the supporting funds must be charged. Let us do so briefly.

In the first place we shall have to build the structure. In our sections on Architecture the details of cost will be given, but there are some very rough figures that may be profitably used just now to give us at least some idea of the amount of money we shall have to use immediately.

Broadly speaking, hospital architects have about agreed that the modern hospital building, without any ornamentation whatever and without any such fittings as plumbing and ventilation, and including only the walls, partitions, floors, doors, foundations, and roof, all of them built of the average material under average conditions, is about twenty-five cents per cubic foot of space occupied by the building. The additional cost, or what we may loosely term extras, will be for ornamentation, varying greatly in amount, depending on the elaborateness or simplicity of the structure; the power plant, the plumbing, including steam, gas, and electric fixtures, and whatever of artificial ventilation it is determined to employ.

Let us take for instance a building 100 feet long, 40 feet wide, and six stories of 12 feet each as the dimensions of the building, that will give us an area of 288,000 cubic feet and an additional 40,000 which we must add for a ten-foot basement, or a total of 328,000 cubic feet. At twenty-five cents per cubic foot, the cost of such a structure, wholly bare of fittings or furnishings or ornamentation, will be $82,000. The fittings for such a building, according to figures allowed by the average hospital architect, and providing for the very best of plumbing, carried in runways in the walls according to the latest approved plan of plumbing installation, will cost $30,000. This will include, however, the necessary installation of steam pipes to carry live steam for sterilization in the operating, dressing, serving, and sterilization rooms, and this will also include the necessary electric installation for light and power and a sufficient amount of gas-piping to duplicate the lighting plant.

Artificial ventilation is as yet so uncertain and unsatisfactory that it may well be considered wholly experimental, and while it may be a question of individual judgment as to whether such a plant should be installed in the present state of the art, there is no question that provision in the walls should be made for it against that day when some satisfactory ventilation scheme shall be offered by inventors. There are a number of kinds of runways installed to carry fresh and tempered air into various parts of the hospital, that which seems to meet with present favor being galvanized iron runways in the walls, varying in size according to the area to be aired and tempered. We will discuss this question of artificial ventilation very much more in detail, and perhaps more dogmatically, under that heading in the sections on Architecture, including an estimate of the cost of such installation. The only other permanent fitting in the hospital, the cost of which ought to be included in the architectural estimates, is the vacuum-cleaning system, and this also we have gone into more in detail under the sections on Equipment.

When we have taken all these items of expenditure into account, we may be able to pretty accurately determine the cost of the building we are to erect, exclusive, of course, of the item of ground for the institution, which will vary so greatly both in quantity of land and price as to prohibit any further discussion, and also exclusive of whatever extraordinary ornamentation may be designed.

It will be noted that no attempt has been made in this section to estimate the cost of the construction of the building on a basis of the number of beds to be installed. Some expert writers on these costs will insist that the only proper com-

putation of cost is per bed, and the figures given will run from $1200 to $2500 per bed. It may be seriously doubted whether such figures are really helpful. The question will come as to the proportion of space in the institution designed to be actually occupied by patients, and the other space that we might call administrative in character, such as offices, reception rooms, kitchens, dining rooms, serving rooms, storage space, and the like.

The equipment of the new building for operating purposes contemplates so nearly the whole question of hospital or institution management that we shall have to dismiss this part of the subject from our thought at this time, referring the reader to the section on Equipment of the General Hospital as an aid to the furnishing of whatever kind of institution he is interested in; and we come now to that peculiarly elastic subject of "running expenses."

RUNNING EXPENSES

In the term "running expenses" we must include every item of cost of operating the institution, including the interest on building funds.

Necessarily any figures touching upon operating expenses must be extremely elastic, and in a work such as this is designed to be these figures must safely cover the expenses incident to running an elaborately planned institution, that is, one in which it is designed to give patients the very highest order of scientific service of every character. The figures herein set down must not be harshly criticized if they are greatly in excess of those shown in the annual reports of average institutions in this country. It is not intended to advocate in this work average institutions or institutions conducted upon the average scale. This work has in contemplation throughout the best sort of institutions known to modern science. For instance, some city and county hospital, poorhouse, and asylum administrators point with pride to their low cost of feeding patients; one large general hospital, conducted by one of the first cities in this country, might be cited as an example; its annual reports cite the fact that it is operated for less than $1 per day per patient. And yet, turning a few pages of this annual report, one finds that there are thirty-six nurses to care for a few short of six hundred patients, and that the pathologic work is performed by one intern, who also has other duties; and, still further, that the raw food for patients, employees, nurses, and interns averages nineteen cents per day per capita. Instead of a record of laudable achievement, may not such a report be regarded as disgraceful and a scandal upon twentieth century civilization? There are no figures to be offered for such conduct of an institution, and no figures to be offered to those who would follow such a lead. It is pleasanter and will be more profitable to describe a rational régime, in accordance with the laws of living as they are to-day and along the lines of the scientific possibilities of the time.

The intimation above that the pro rata cost will be about the same whether the institution be a hospital of fifty or five hundred beds will have been noted by the reader. This will bear a momentary pause for contemplation. The statement was not made without due reflection. It is true that in a large institution purchase prices will be lower; the hospital that can buy half a million yards of gauze at a time will undoubtedly obtain these goods at a lower price than the one permitted to buy only fifty thousand yards; and food purchased in large quantities will be likewise lower; and it might be that heads of departments could manage a large number of people quite as well as a small number, as, for instance, a head janitor could superintend the operations of fifty floor men, wall washers, window

tion, and operation. If we have dwelt upon the problem of a new institution in a new community, it has been wholly for the purpose of discussing the question from its inception to its realization. The problem will hardly come in a new shape to most of us. We have already made the start; we have a hospital or sanitorium or orphanage already in operation; it has grown too heavy a financial load, or it seems not altogether in tone with the greatest local need, or in some of its parts the machinery seems not to work well. In what we have said heretofore in this chapter we have tried to present some basic thoughts, which, while they may not fit the special case, will, at least, raise some doubts about present methods and so move toward new view-points; and, finally, in the mental struggle we may arrive at a successful settlement of our individual problem, whatever it may be.

We have started out with the conception of a new institution in the mind of perhaps a single individual; we have seen the idea grow until it became a community-wide problem; we have attempted to give it direction and force, to supply the details as to the kind, character, and size of institution needed; to offer a few suggestions as to the creation of a strong and enduring organization behind it; to point out some of the means by which the modern institution may be financed and some of its avenues of expenditure.

The pathway we have trod in the story is worn hard by the travel of many tired feet; the ashes of old camp-fires are everywhere along the way, where those who have been lost in the mazes have stopped to rest and build up new strength for the further journey over the rocks and through the woods of perplexity. Our roadway has led into no new and unexplored country, but perhaps some of us by traveling day after day and year after year have found a short cut here and there where the going is smoother and the road is pleasanter.

If this section shall have added a single new thought, or led to one new idea, or given a single ray of light to one fellow-traveler whose burden is heavy, it will not have been written in vain.

	Cents.	Per Cent.
Provisions:		
Raw food—per patient, not per person	$ .766	30.7
Surgery and Dispensary:		
Drugs and drug sundries Appliances Instruments Wines and liquors and alcohol *x*-Ray supplies Laboratory and sundries Gauze, cotton, gas, etc	.206	7.8
Domestic:		
Crockery Silver and glassware Kitchen utensils Cleaning supplies Hardware and brushes Fuel and light Repairs and expenses Laundry supplies Miscellaneous hospital supplies Bedding and linen Furniture and fixtures, etc	.263	10.9
Establishment Charges:		
Insurance Taxes, etc	.017	.7
Power Plant:		
Fuel Oil and waste Ice plant, etc	.20	8.0
Rent	.014	.6
Salaries and Wages	.913	36.6
Miscellaneous:		
Printing and stationery Postage Advertising Telephone and telegraph Sundries	.053	2.1
Management:		
Incidentals—Auditing, etc	.064	2.6
	$2.496	100

Let not the prospective hospital builder or board be frightened at the presentation of figures of expenditure. These are not hard-and-fast figures, and many economies can be practised to lower them here and there under conditions that exist in every hospital. For some institutions the raw food figures might perhaps be higher, although that is not likely, and in some places they will be materially lower. The question of hospital help will be subject to variation. In a good many places convalescent patients can be pressed into service to perform quite a considerable amount of the unskilled labor of the institution. In asylums, poorhouses, orphanages, and even in some general hospitals where convalescents are kept until well advanced in convalescence, there will be practically free help available to grow farm products, if the land is at hand; to raise poultry, if there is an expert director for that department of industry; and to care for and milk the institution's own herd of cows, if it be practicable for the institution to keep a herd.

Let us now pause for a moment on the ground we have just covered, in order to fix in the mental vision some essential points in institution organization, construc-

tion, and operation. If we have dwelt upon the problem of a new institution in a new community, it has been wholly for the purpose of discussing the question from its inception to its realization. The problem will hardly come in a new shape to most of us. We have already made the start; we have a hospital or sanitorium or orphanage already in operation; it has grown too heavy a financial load, or it seems not altogether in tone with the greatest local need, or in some of its parts the machinery seems not to work well. In what we have said heretofore in this chapter we have tried to present some basic thoughts, which, while they may not fit the special case, will, at least, raise some doubts about present methods and so move toward new view-points; and, finally, in the mental struggle we may arrive at a successful settlement of our individual problem, whatever it may be.

We have started out with the conception of a new institution in the mind of perhaps a single individual; we have seen the idea grow until it became a community-wide problem; we have attempted to give it direction and force, to supply the details as to the kind, character, and size of institution needed; to offer a few suggestions as to the creation of a strong and enduring organization behind it; to point out some of the means by which the modern institution may be financed and some of its avenues of expenditure.

The pathway we have trod in the story is worn hard by the travel of many tired feet; the ashes of old camp-fires are everywhere along the way, where those who have been lost in the mazes have stopped to rest and build up new strength for the further journey over the rocks and through the woods of perplexity. Our roadway has led into no new and unexplored country, but perhaps some of us by traveling day after day and year after year have found a short cut here and there where the going is smoother and the road is pleasanter.

If this section shall have added a single new thought, or led to one new idea, or given a single ray of light to one fellow-traveler whose burden is heavy, it will not have been written in vain.

PART I

HOSPITAL ARCHITECTURE

FOREWORD

THE following work was written to place the various kinds of building materials, devices, and arrangements before people interested in the building and management of hospitals, so that prospective builders may intelligently select the article best suited to their needs, the local conditions, and the available funds.

The writer has studied materials in use in hospitals for upward of fifteen years, and the statements are made with such authority.

It is not a treatise on the architectural art or the science of construction, but a simple exposition of the ordinary, also latest, practice of building in this country for hospital purposes.

The planning of a hospital is probably more difficult than the planning of any other kind of a building under the best of conditions, that is, with unlimited land and unlimited funds; but when the site and the funds are restricted the problem becomes further complicated and depends so much on the surroundings, the method of management, and its intended use that it is practically impossible to lay down rules which can be followed and which will fit every case.

Few architects understand that there is a great difference in the management of hospitals, and that which is considered excellent in one institution may be held execrable in another. In consequence, many institutions are built without a proper understanding between the architect and the management. The scheme devised by the architect may operate like a well-made machine in the hands of one person, and may break down completely in the hands of another trained in an institution having a totally different method of operation.

This argument is not advanced to defend all of the architectural mistakes, but many of the so-called mistakes are thereby explained. In too many instances the management looks to the architect as a person of unlimited knowledge of all the details of hospital management, and pays but little attention to his sketches and plans when they are submitted in the formative stage, and he, in turn, hearing no criticism, believes that his sketches and drawings have had the study and approval of the management or building committee, so that no one is aware of the shortcomings in the building until it has progressed so far that the damage is irrecoverable.

Almost every architect is only too glad to have an intelligent criticism of his preliminary work, for a piece of work that is satisfactory to its users and patients will redound to the credit of all connected with it. It might be wished that superintendents, matrons, superintendents of nurses, and directors appreciated that a failure in the proper working out of a plan can easily be avoided if they would gather their views into a sensible co-ordinated statement, and discuss these with

the architect before the plans have advanced to a point where it would mean loss to the architect if he had to begin over again, and discuss the various points with him, each patiently listening to the other's criticism or reasons why any arrangement under discussion will not permit of proper or economic administration, or may not be good planning, and thereby arrive at a mutually satisfactory arrangement.

Naturally, the architect, expert and learned though he may be in the technic and practice of his own profession, cannot be expected to be familiar with the details of the work of the hospital superintendent, housekeeper, superintendent of nurses, and the various departments heads; therefore, he must rely in a large measure upon those who are familiar with hospital administration for suggestions concerning the utilitarian purposes of the building to be erected.

There is another difficulty just here, too, in that very few hospital workers seem to be able to interpret even the simplest rough sketches, floor plans, elevations, and details. The result is that they are inclined to attach a blanket approval to whatever is submitted to them, and then, after the specifications are drawn and even after contracts are let, they come in with an eleventh-hour protest against plans that already have received the unanimous and supposedly intelligent approval of everybody concerned. All this means that the architect is entitled to an intelligent and painstaking study of his plans by those who are considered worthy of having responsibility placed in their hands.

THE SITE

The situation of a hospital is of prime importance, and the existing and possible future surroundings must be carefully considered.

Often a hospital obtains possession of a piece of property by gift or bequest at the inception of the enterprise, or an existing hospital is in possession of a piece of property when the time for an important increase in the size of the institution arrives. The piece of property in question may be totally unsuited for hospital purposes and should be abandoned, and, although such abandonment may be heroic and an apparent sacrifice, the loss in many cases will be only temporary.

Unsuitable sites hamper the growth of the institution, the constant increases or changes required to keep step with the progress of medicine, or an impending change in the neighborhood from a residential quarter to a business or manufacturing quarter, or the modifying of the hospital clientele to a locality situated at a greater distance from the hospital may make such a site undesirable for the purpose. Generally, the difference in cost between a new site and the selling price of the unsuitable site is small and a very small percentage of the total investment.

The more the location and surroundings of a hospital approach those desirable for a high-class residence, so much more will the site be desirable. Ample air, distance from neighboring buildings, distance from the dust of the streets, and noises caused by steam railroads, street traffic, electric railways, and manufacturing plants are all of them exceedingly important to hospital patients. If a hospital is close to dusty streets the dust will enter the building, of course, through open windows, but also through crevices around tight windows. The ventilating apparatus will become clogged and very costly in point of constant attention to keep the air-washing devices in the perfect operation necessary to prevent the dust from entering the ducts.

Inasmuch as most hospitals must be maintained within the limits of large cities, close to their activities, they must be built on restricted ground areas. In such cases the fresh air and ventilating devices must be more highly organized

the side walls remaining the same. In such cases, it would, however, be best to arrange for the fitting of casement sash, so that they may be used as parlors in stormy weather.

A small complete hospital contains all of the parts which a unit of a large hospital should also have, and, inasmuch as proper administration requires the division of a large hospital into parts or units, any one of these should be the same as the ward floor of a small hospital. In a small as well as in a large hospital one floor of any unit may be arranged for an administration, or service, or nurses' teaching, or operating department.

Many large and elaborately illustrated works have been published on Continental European hospitals, but these are of little value to the American builder, for the foreign builders do not appear to consider it necessary to have the conveniences and accessories to the wards considered so essential in this country, nor do they have many private rooms. In the European plans often one bath to a floor appears to be considered sufficient, whereas in this country very many patients demand separate rooms and private baths.

Whatever private rooms they have are usually on the corridors of the wards, where the patients are subjected to the noise of communication and curiosity of other patients, whereas American practice endeavors to locate the private rooms away from corridor traffic, to make them as quiet and give them as much privacy as possible.

American designers are planning hospitals with more single, two, three, or four bed wards, and with fewer large wards. This may increase the cost of nursing and other service, but it assists in isolation and classification, and, considering that many more people capable of paying at least part rates are making use of hospitals, the additional cost is thereby balanced.

A building for convalescents is very helpful to patients, and will often be remunerative to the hospital; such a building need not be as highly detailed or as fully equipped as the hospital building proper, for the convalescents can help themselves to a great extent, can go some distance to their meals, so that a much cheaper grade of building will suffice.

A unit in proportion to the size of the proposed hospital should be designed and one of these incorporated in the whole plan for each department, such as male medical, female medical, male surgical, female surgical, maternity, private rooms, etc., each one as far as possible self-contained so as to keep the nurse close to her patients, and make it unnecessary to leave the unit while on duty; the surgical units should have a surgical dressing-room, the maternity department, a nursery, labor rooms, and accessories, and each of the others their special requirements.

The units must be in easy communication with the kitchen, the general laboratory, the operating department, and other common divisions.

A unit should have the following rooms:

1. The ward or private room.
2. Toilet room.
3. Nurses' toilet room.
4. Serving room or diet kitchen.
5. A quiet room for one bed.
6. Bath-room.
7. Utility or sink room.
8. Cabinet for linen.
9. Cabinet for medicine.
10. Station for nurses.

often a detriment, for if the space did not exist, useless plunder would be destroyed or sold and not allowed to accumulate to gather dust and become dangerous as a fire hazard or in affecting the purity of the air. Large and useless cellar spaces, unless carefully built and maintained, are also likely to become foul and noisome.

In the institutions mentioned previously, where the first floor was less than a foot above the surrounding ground, every square foot is usefully applied to the many auxiliary activities of the hospital, and the space which is generally created at a considerable cost and used only for storage and waste space is converted into valuable space by the additional cost of finishing, and actually one story is gained.

PLANNING THE HOSPITAL

A plan should be laid out with reasonably straight lines to permit easy observation, good illumination, ventilation, a good circulation from section to section, and a proper interrelation between its parts. It should be a good architectural composition not simply to be one, but because a good composition will afford all such desirable qualities, whereas a heterogeneous jumble of rooms, curved, broken, and contracting and expanding corridors will defeat and prevent the desirable qualities, making administration and cleaning difficult, almost impossible. Moreover, it must be understood that straight lines and rectilinears are stock materials, and any deviation from these adds immeasurably to the expense of a building.

Wide corridors are attractive in appearance, facilitate communication, and assure good ventilation, for they provide a large volume of air when windows must be kept closed. They sometimes impress the laymen as unnecessarily costly, but they are not, for they are the least expensive part of the structure; one foot or more added to the width adds only to the cost of floor and roof construction, and not of walls, partitions, equipment, or any of the units, such as doors or windows. When reinforced concrete floors are continuous from outer wall to outer wall, over the two corridor walls or girders, fairly wide corridors actually effect an economy in the amount of steel and concrete in the floors or the rooms each side of the corridors.

Very large hospitals, such as governmental institutions, will usually be built with separate buildings connected only by tunnels and possibly covered walks on the roofs of same, the separate buildings obtaining power and light from a central station, but the majority of hospitals to be built will probably house less than 250 patients, and will be built in cities where they should be fairly close to the homes of patients, and will, therefore, be built where land values are comparatively high, which will result in restricted dimensions, and this does not permit of spreading the buildings over acres of ground. The most suitable plans for such areas are the semi-isolated pavilion type of the block plan, which can be combined in a variety of arrangements and some of which are shown in the illustrations.

Where there is sufficient land area to make it possible to build single buildings, that is, completely isolated pavilions, this should be done, connected by one-story enclosed corridors for service piping, and used during inclement weather, with covered open passages on the roof. If the roof is sufficiently low and overhanging, there can be no objection to their use in any kind of weather.

Wide connecting corridors provide pleasant open-air porches and are very convenient to the connecting pavilions, and if the pavilions are two stories high and the passages the same, these must be quite wide and imposing to avoid an ungainly appearance. Probably 20 feet is not too wide and does not add much to the cost, for this is only in the excavation, floor and roof construction, the cost of

and the few absolutely necessary administrative offices; toilet, bath, slop, sink-room, nurses' retiring-room, supply room, and a sun porch in the semicircle at the end.

The following plans illustrate combinations of two, three, four, and more units and the manner in which they are customarily assembled to obtain different capac-

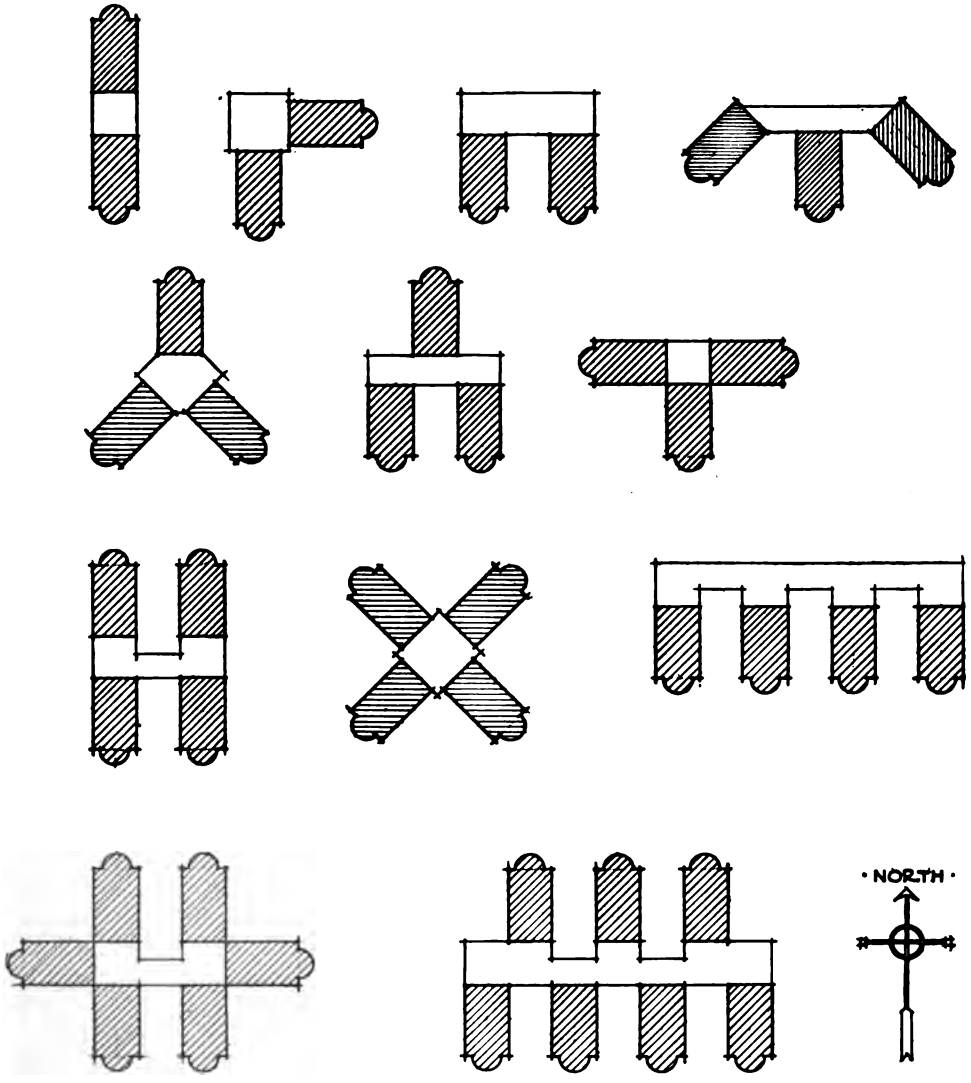


Fig. 3.—Various combinations of units assembled in various ways to suit varying capacities and conditions.

ities, and huge institutions are merely modifications of these arrangements, to meet particular conditions, special sites, or individual taste. Under the chapter on the Architecture of the Small Hospital, we have gone somewhat into detail concerning economies in space, cost, and convenience, but the units themselves are the same.

Plan of Unit

If the units can be made large enough, one or more of the following will be of advantage:

11. A solarium.
12. A reception alcove or room.

Where two or more units are close together, Nos. 3, 4, 5, 11, and 12 may sometimes be arranged so that they can be used in common.

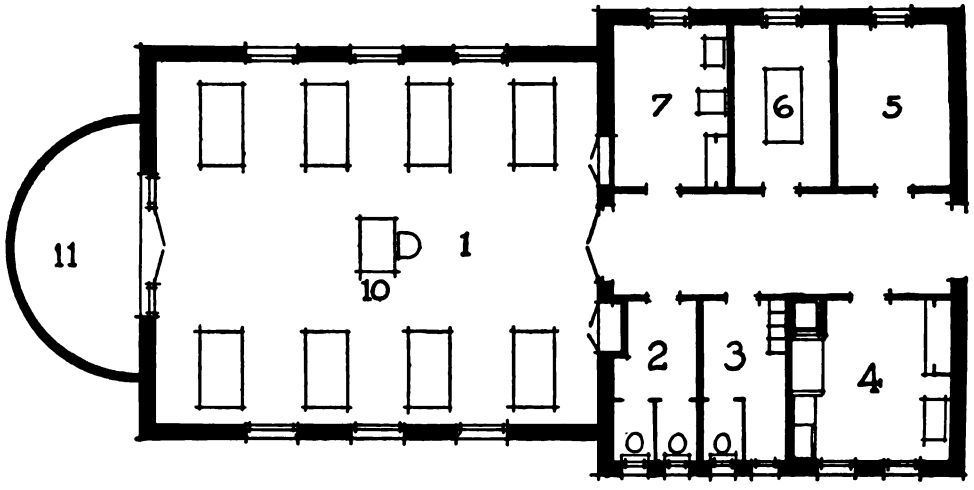


Fig. 1.

The same space occupied by a ward can be divided into a number of single-bed or private wards, or into half-pay wards. One of these units may be one-story or any number of stories in height to increase the capacity.

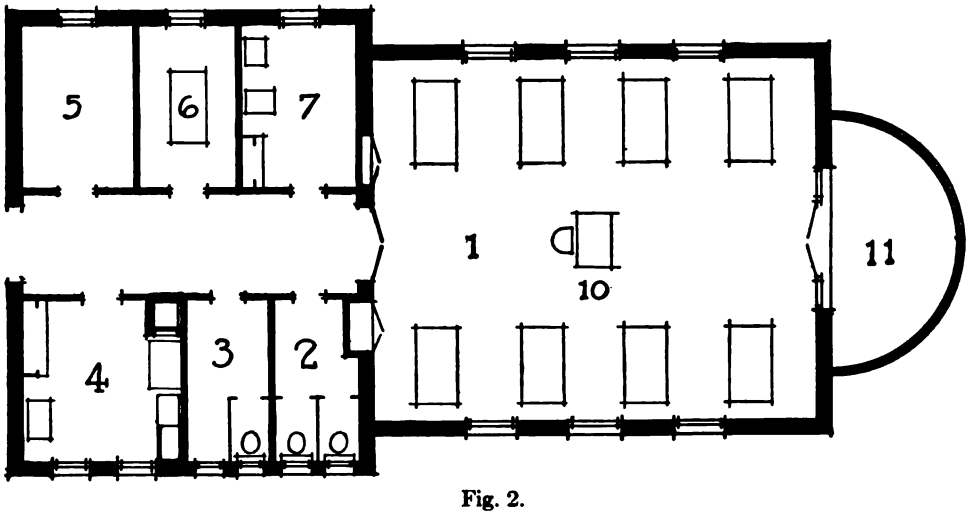


Fig. 2.

The small plans (Figs. 1 and 2) show a development of one of these units in the simplest form, with wards, a single private room, a quiet room for emergency,

and the few absolutely necessary administrative offices; toilet, bath, slop, sink-room, nurses' retiring-room, supply room, and a sun porch in the semicircle at the end.

The following plans illustrate combinations of two, three, four, and more units and the manner in which they are customarily assembled to obtain different capac-

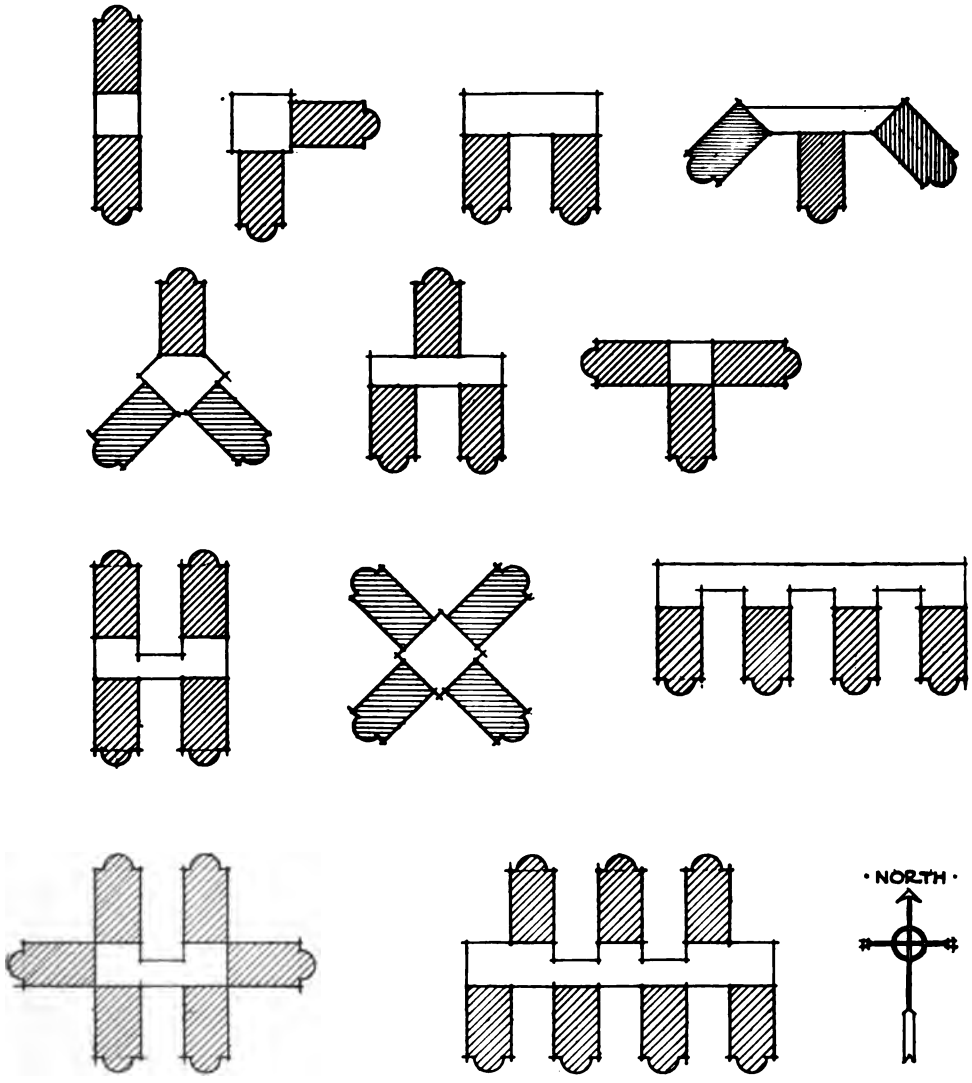
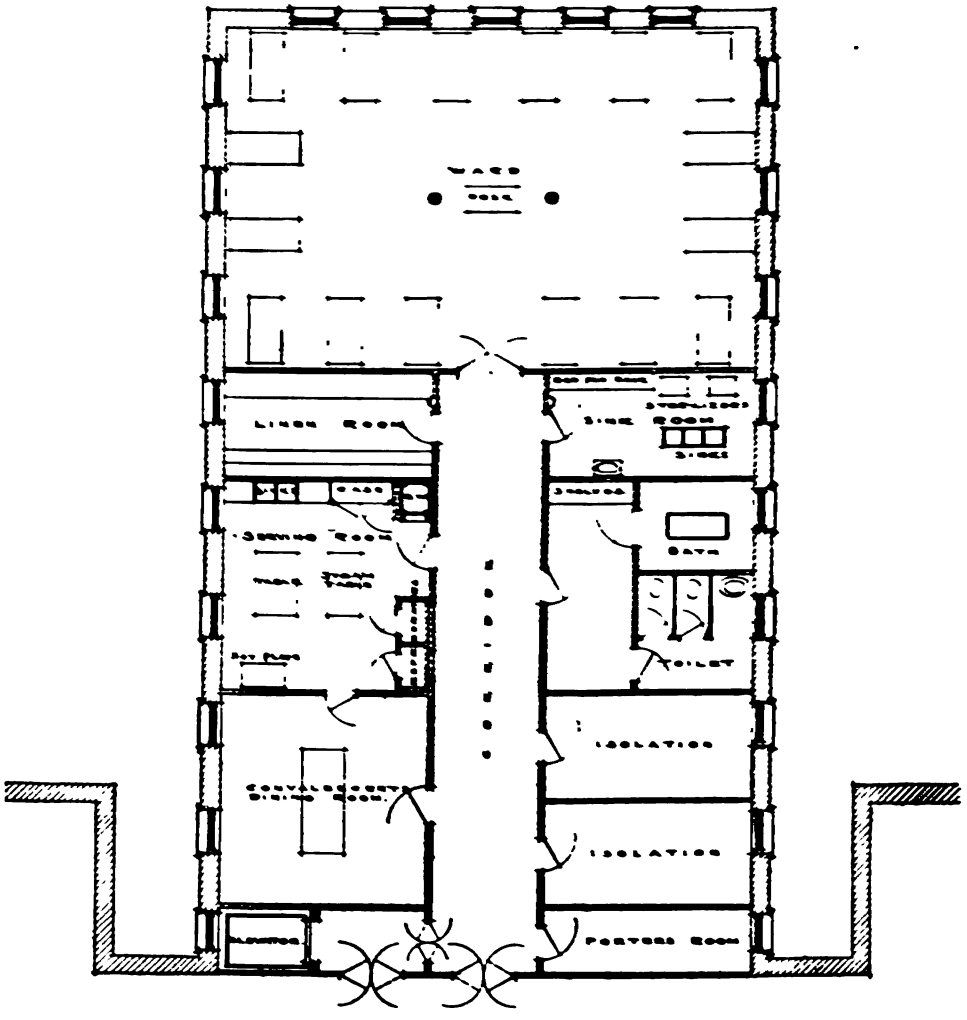


Fig. 3.—Various combinations of units assembled in various ways to suit varying capacities and conditions.

ities, and huge institutions are merely modifications of these arrangements, to meet particular conditions, special sites, or individual taste. Under the chapter on the Architecture of the Small Hospital, we have gone somewhat into detail concerning economies in space, cost, and convenience, but the units themselves are the same.

IBRARY
OP FUND

The serving-room for taking care of the food is properly located at some distance from those offensive rooms—the bath, toilet, and slop-sink rooms—and the convalescent dining-room is properly located at a point furthermost from the ward, because it is unnecessary that it should be any nearer.



MEDICAL WARD ARRANGEMENT.

Fig. 7.

The combination of double swinging doors at the entrance to the suite are for the ingress and egress of patients, either to or from the suite, into and out of the building. In this arrangement the elevator is also situated at the end of a small vestibule, which takes away a great amount of the noise normally coming from an elevator.

THE SURGICAL WARD UNIT

The surgical ward unit may be arranged precisely as the foregoing, excepting that there should be a dressing-room for surgical patients. This might be made in the same space by constricting somewhat some of the other rooms, or one of the isolation rooms might be taken for the purpose. A good deal of the dressings in such a surgical ward could be done at the bedside, by the use of a dressing cart loaded with dressing accessories.

ARRANGEMENT OF THE OPERATING SUITE

Before we discuss the ideal operating-room, or suite, we must understand in a general way what is to be done there.

Of course there must be a surgical operating-room, or several rooms, as the case may be, and as we shall need sterile water, and as the instruments must be sterilized immediately before, and sometimes during, the operation, it will be necessary to have the sterilizing room nearby. Supplies are constantly called for, and therefore there must be a supply room in the vicinity. The instruments must be taken care of properly after they have been used and washed, and there must be a case for them; and, if the institution is large enough, there should be a room kept under certain physical conditions as to dryness. There is washing of every sort, soap and solutions to be made, utensils to be boiled, and all these things make it necessary that there should be a wash-room with basins, sterilizers, and gas plates. Anesthetics must be given, and it is becoming more and more the custom to give the anesthetic in another, rather than the operating-room, because of the mental effect on the patient; therefore, one or more anesthetic rooms must be provided, which may be used also for the preparation of the patient. There ought to be quarters for the surgeons, and in this room there should be a sufficient number of lockers to serve the number of men who operate, and since modern surgery demands cleanliness of person on the part of the surgeons, it is desirable to have in the surgeons' dressing-room a shower bath, an ordinary bath-tub, a toilet, and a hand wash-basin.

In some hospitals there are many medical visitors who come to see surgery; it is the custom for these men to take their coats and vests off and to don an operating coat or gown, each institution being a law unto itself as to the character of the visitor's gown. It is not desirable to have these casual visitors frequent the regular surgeons' dressing-room, therefore there should be a visitor's dressing-room with lockers, a table with writing material, perhaps a lounge, and some institutions have a telephone for the use of visiting physicians.

The nurses are perhaps the most important factor of all in the operating-rooms, and, although most surgeons seem to overlook the fact in their demands on the nurses in the operating service, these girls are just ordinary human beings, and quite as likely to become exhausted and fagged out as the surgeons themselves, and oftentimes one of them will get sick while at work, so that by all means the nurses ought to have a room for themselves in connection with the operating suite, which should be equipped, just as the surgeons' dressing room is equipped, with lockers, a shower and bath, toilet and basin, and there should be a lounge in the nurses' room, so that a tired girl may rest sometimes.

Last, but not least, there is an immense amount of cleaning and janitor service to be performed in connection with the surgical suite, and there ought to be a small room in which to keep the janitor's supplies, mops, buckets, ladders, and brooms.

And if there could be still another room, that might be kept under lock and key for the safety of the larger apparatus occasionally called for in the operating-rooms, it would be an economy, because in many places these things set around, to be fingered and handled by casual visitors, and oftentimes they are put out of order and are not ready for use when called for—such apparatus as the large cautery, the jury mast and attachments for putting on body casts, the surgeons' bone-drill, the battery for cystoscopic work, and perhaps some of the cases of the larger instruments.

There are many institutions that will not have all these rooms, but it is equally certain that every institution competent to handle modern surgery will have to meet all the requirements of such an operating suite as has been outlined. In other words, no matter how small a hospital, there must be instruments, and there will have to be a case for them, and they will have to be kept in a dry place or they will rust and soon become useless. There must be supplies in even the smallest hospital, and sterile hot and cold water, and the instruments will have to be sterilized, and one of the worst possible things is to boil instruments in the operating-room, so that there ought to be some place in which to do this sterilization. The anesthetic must be given, even in the smallest hospital, and if it is not to be given in the operating-room itself, there must be a small room in which to give it. The surgeons and nurses must dress and undress, and there certainly must be a place for them to perform these offices. In many institutions, large as well as small, all sorts of makeshifts will be resorted to to meet the requirements that have been outlined. Sometimes the wash-room, sterilizing-room, and supply room are in one; sometimes there is only a closet for the surgeons to put on their operating-room paraphernalia, and the nurses are compelled to use the supply room for this purpose, and a corner in the same room will perhaps serve for the janitor's supplies. In such an institution the anesthetizing-room will be dispensed with, and patients will be put to sleep on the operating table, in spite of the fact that sometimes they are almost frightened to death at the sight of white-robed, white-masked surgeons and nurses flitting about.

Figure 8 shows rather an elaborate operating suite that seems to meet most requirements. The plan provides for three operating-rooms and their auxiliaries. This whole scheme may be constricted to provide for one operating-room only.

The three operating-rooms are side by side, each having its northern window lights, of any design that may be selected. There is a side window in each of the two end rooms for additional light and air. All of these rooms open by double swinging doors, containing stops and checks, upon a common corridor of rotunda form, to allow of the easy handling of carts. In some operating suites the sterilizing-room is placed between the operating-rooms, with shelf window between it and each operating-room, for the handling of supplies and water; this arrangement is unsatisfactory, because the sterilizing-room is of necessity a very hot place in the summer time, and nearly all sterilizers emit at least some steam into the room, no matter what preventative devices are used. Both the heat and steam are objectionable in operating-rooms; therefore, it seems better to have the sterilizing room across the corridor from the operating suite, as indicated in the drawing. The sterilizing-room, containing water, instruments, dressing, and salt-solution sterilizers, can be kept cool by an exhaust fan above the window, which will serve to draw the hot air out of doors. It would seem a much more advantageous arrangement if there were a common dressing sterilizer-room somewhere else, in the basement perhaps, with a sufficient number of sterilizers to make up supplies in drums for all parts of the house, and have these supplies distributed daily. The

same may be said of the salt-solution sterilizer, excepting, perhaps, that in some institutions these normal salines are kept ready for use at a temperature that will make them immediately available, and where that is done perhaps it will be better to have the salt-solution sterilizer in connection with the operating-room suite.

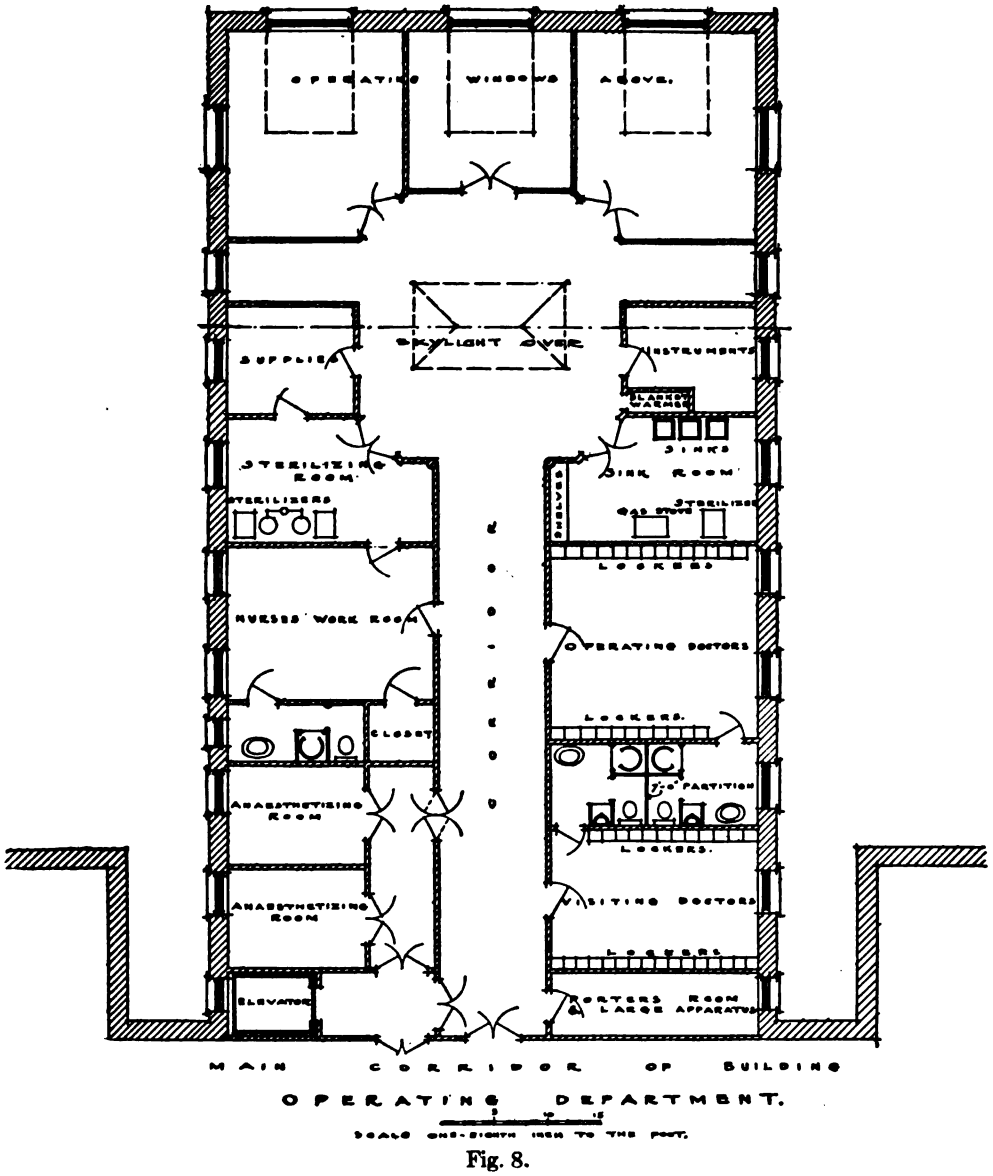


Fig. 8.

The next room of this suite on the same side of the general corridor, leading from other parts of the hospital, will be the supply room. The shelving, closets, and lockers of the supply room will be obvious in their arrangement.

Just off this supply room is a long narrow slit in the wall, the blanket warmer. This is an ordinary laundry drier, with steam coils in the rear. The carriage is

run in and out on tracks just as in the laundry. This little drier has an immense usefulness in the operating-room suite. It practically does away with the necessity to warm beds by the use of hot-water bottles in preparation for patients expected from the operating-room. Where this drier is used, it is the custom to hang the horse full of all-wool blankets, and as many as may be needed are tucked about the patient when he is taken from the table to the stretcher, and he can be put into bed when he arrives at his room, with these hot blankets still around him. Patients get to bed in a very much better condition, and freer from the shock of the operation in this way, and the peripheral circulation is very much hastened when the patient is wrapped up in hot blankets immediately at the conclusion of the operation, and the burning of patients by hot-water bottles, so common in hospitals, is practically ended. The vitality of the patient under an anesthetic, and especially at the end of a long operation, is very low, and a hot-water bottle, containing water at 120 degrees, will oftentimes make a very serious burn. This little hot-blanket room practically does away with all this danger. By the time the blankets are cold the patient and the bed are warm, and the blankets can then be removed, sterilized, and returned.

Next to the supply room is the wash-room, with its hand-basin, sinks, gas plate, utensil sterilizer, and a row of shelves; here the soaps are made, sponges boiled, and instruments cleaned.

Still further along, on this same side, is the instrument-room. There is no door between the wash-room and the instrument-room, because it is necessary to keep the instruments very dry, which will not be possible if steam from the wash-room is allowed to penetrate. This instrument-room should be plainly furnished; the instrument case itself and a long table will be all the furniture required, with the possible exception of a white enameled stool or two for the nurses to use while arranging and putting away the instruments. The last room on this side of the corridor is for the janitor's stores; this room, if occasion requires, can be used also for keeping the larger apparatus, where the janitor and operating-room orderly are one. The average house man, who would be called upon to mop the floors in the operating-room suite, would slap a wet mop against a piece of valuable apparatus and rust it beyond all usefulness in a short time, and the first intimation of the fact would be when the instrument was called upon for use.

Let us now go back to the other side of this main corridor, where the first two rooms are arranged for anesthetizing the patient. These rooms ought to contain, in the shape of furniture, an operating-room table, a cabinet to hold the anesthetics and masks, and the scrubbing-up material, such as soaps, ether, alcohol, iodin, and brushes. There ought to be a small anesthetic table and stool, and an ordinary table at the side of the room for emergency purposes. There ought to be a basin with hot and cold faucets, a brush and comb box above the basin and at the side of the mirror, because oftentimes patients will come to the hospital to take "a whiff" of gas for some slight operation, and they will want to spruce up again and go home. The gas-anesthetizing apparatus will, of course, be in these rooms, and the carbonic-acid freezing set for the quick removal of warts, moles, and nevi, with the frost pencil.

The next room is the nurses' dressing-room, with shower, toilet, basin, and couch.

The next room is the surgeons' dressing-room, equipped precisely like that of the nurses', and, last of all, the locker-room for visiting physicians.

Some surgeons choose to have, in connection with the operating suite, a series of recovery rooms. The advantage of this arrangement may be doubted. When

the operation is concluded the patient is asleep, the wound is fresh, and not yet sore, and he would not feel pain in any event; therefore, it would seem to be good practice to rush the patient, covered in hot blankets, back to the bed where he is to remain, as quickly as possible. If the patient is allowed to remain in a recovery room on the car for two or three hours, or even twelve hours, he is sick and sore, perhaps nauseated, and it will be very much more painful and more difficult to move him then than it would be in the first place. Moreover, many times patients need a great deal of attention from the nurses immediately following the operation—there may be nausea and vomiting. They may need a "hypo," either of morphin or strychnin. They may need irrigation—abdominal, subcutaneous, or intravenous—and, under any of these circumstances, it would seem very preferable to have the patient back in his own bed, where he is going to remain, as soon after the operation as possible.

DETAILS OF STRUCTURE

FOUNDATIONS

The type of foundation which is to be employed is an engineering question, depending on the height of the building and the nature of the soil. Generally, hospitals are not high, and, inasmuch as their floor-carrying requirement is very low, the ordinary spread foundations are the most suitable and economic, and in localities where the contractors are conversant with reinforced concrete construction the foundations should be built of this material, provided that the cost of the material compares favorably with the cost of other materials for foundation uses in the same locality. Reinforced foundations save on the excavation and on the amount of material.

Rooms which are to be used for service cannot have the footings which are obligatory when common rubble stone is used. In some localities rubble stone is so cheap that it should be employed, but the builder must weigh carefully the additional cost of excavating, and it should be laid in mortar composed of Portland cement and a coarse sand without the admixture of lime. Inasmuch as lime is hygroscopic, a wall laid with lime mortar and below ground will be moist almost continuously and certainly intermittently. Gravel and crushed stone or crushed slag are equally good for mass concrete such as is usually used in foundation walls.

It is not generally known that ordinary cement concrete is not a dependable material for the building of waterproof basements or cellars. To obtain such it is necessary to employ special mixtures and unusual care, which results in a completed work of unusual cost.

The simplest arrangement to obtain a dry basement is to have the elevation of the basement floor several feet above the drains, and to drain the subsoil under the basement floors and the ground surrounding the building by agricultural drain tile laid below the level of the basement floor, so that, if the house-drains and the street-drains are of sufficient capacity to take off the greatest known precipitation for a given time, it will hardly be necessary to make any other provision to obtain a dry basement, for water will follow the line of least resistance, and will follow the outer surface of the cellar wall to the nearest drain tile, unless the wall is so badly built that there are actual channels for the water through the wall. The customary plastering of the exterior of the wall with cement-mortar will prevent much seepage if the plastering is done reasonably well. Where a site is below the line of drainage, or where the sewers are so small that their carrying capacity

is overtaxed, it will be necessary to make special provisions, either by making the floors and walls actually waterproof, as though the cellar or basement were the hull of a vessel floating in the water, or by providing piping for the interception of seepage at every possible point of entrance, and providing channels which will be the line of least resistance and lead the water to basins which can be drained by automatic ejectors. In very small cellars an automatic water-lift will be sufficient, and these are of low price, but in large establishments, or where considerable ground water must be removed, power ejectors are necessary. The water can be removed by the use of a steam ejector, but this is an expensive method, not automatic, and limited. Automatic electric bilge-pumps and compressed-air ejectors have been in use for many years and are satisfactory; they can be obtained in units of many sizes and prices, and are usually installed in duplicate, to have one in reserve in the event that one of them fails to operate.

The waterproofing of walls and cellar floors can be done with a mixture of special compounds and Portland cement, and troweling these mortars on the surfaces. There are a number of very good mixtures on the market. The disadvantage of such a method is that the slightest settlement may open a hair crack in the floor or wall and permit the ingress of water. The building of specially prepared felts, asphalt, or bitumen into floors, and joining these into the walls and continuing the same as an envelope on the outside of the walls to the ground surface, is the most certain method of building a permanently water-tight vessel, and it has been most generally used in works of importance, such as tunnels and subways. This is also an expensive operation, on account of the special materials, care, and workmanship, and is not employed except in special cases.

WALLS AND FACINGS

The means at the disposal of the institution will usually dictate the facing of the exterior wall, and, granted that the hospital must have incombustible walls, such as concrete or masonry, and that frame walls are not to be considered, the relative cost of the different materials is about in the following order in the vicinity of Chicago:

Hollow tile unplastered, common brick, which can be laid in red mortar, paving brick, cement blocks, common brick plastered with cement, or common brick plastered in pebble-dash cement; hollow tile plastered in pebble dash; a high grade of pressed brick, then limestones, sandstones, and granite. An exterior of paving brick, trimmed with granite for the base courses and entrance steps, and stone or terra-cotta trimmings, will be durable and suitable for a hospital, and it will probably serve the public best if the further money which may be at the disposal of the institution is used for an extension of the work of the institution, and a more elaborate use of costly materials on the exterior of an institution may be considered a waste.

Practically all stones and concrete except granite absorb considerable water, which discolors them, and is also very likely to cause deterioration by the action of frost; consequently a base of granite directly on the ground is very desirable to keep the base of the wall dry and in good appearance. Notwithstanding that there may be a waterproofing course through the walls at the level of the ground, the splashing of the storm water on the ground or on walks and rebounding to the walls will frequently water-soak the base of the walls, and, whether of brick, terra-cotta, concrete, or stone, this will have its effect in time; consequently an impervious material, such as granite, is most desirable.

Generally brick is the most economic incombustible material. In localities where the price of brick or of skilled mason labor is high, walls of hollow concrete blocks or of monolithic concrete may be an economy. The exterior treatment of such walls is, however, rather difficult and somewhat expensive. If the material is to be of good appearance as it comes from the forms, these must be made very carefully, and are, therefore, expensive. The concrete must be mixed with carefully gauged materials, and placed against the forms with extraordinary care, and even then ragged spots often appear on account of the leakage of water through the forms, and an invisible repair is well-nigh impossible. It is sometimes feasible to remove the forms of vertical portions very soon after the material has been placed, and wash the fine material from the surface by the use of stiff brushes and clean water. When this is done the finished surface will have the appearance of a rubbed natural stone, and is a highly satisfactory method for small pieces of work. Another method is to wash the concrete, after the forms have been removed, with a dilute acid, which will dissolve the fine cement on the surface and also produce a pebbled appearance.

Granite Mix.—Washing the surface of concrete when still new, or washing it with strong acid, removes the cement and exposes the aggregate, which should be composed of material broken into comparatively small pieces which have small voids in between them. The low-priced materials, such as coarse sand, fine gravel, or crushed stone, generally do not have a desirable color when so exposed. Inasmuch as the mixtures of fine stuff are not advisable or economic for the full thickness of the walls, these mixtures must be placed against the forms in thin layers and in courses, as the height of the whole of the wall is increased. The facing of fine stuff is backed with the coarse mixture and these sequences until the completion of the work.

The facing of fine stuff does not require much material, and can, therefore, be made of materials which will have a more pleasing color than sand or crushed stone for a small additional percentage of the cost of the whole concrete work.

The mixture of 5 bags of granite screened through a No. 5 sieve, 2 bags of Blanc white cement, and ½ bag of ground mica has made a concrete which resembles dressed granite of the same kind as used in the mixture so closely that a layman could hardly detect the imitation. Mixtures of crushed red and crushed black granite with mica and white cement and many other combinations are possible.

The design of concrete work is sometimes such that it is impossible to remove the forms early enough to wash the surface with water or acid, and it is then impossible to remove the surface cement in this manner, but the texture and color can be exposed by bush hammering the surfaces in the same manner as natural stone is bush hammered. This will result in a very satisfactory surface finish.

Journeyman mechanics capable of executing such work are as yet very rare. A few of the larger construction companies have trained a limited number of men to execute such work, but as yet such labor is not an ordinary commodity on which contractors will bid on small profits and narrow margins for contingencies.

The difficulty of preparing concrete blocks of uniform or equal absorption, and the unartistic appearance of these blocks, which are often too large in scale for the wall surface, or of poor proportion, makes them unsatisfactory material for the facing of buildings. Unequal absorption causes a spotty appearance after a rain-storm, and also causes some of the pieces to absorb dust and soot. The unsatisfactory appearance of concrete block buildings is largely caused by unwise economy, which prompts the use of as few molds as possible; consequently the design does not follow the law of proportion. In order to design the blocks accord-

ing to proper laws of proportion a large number of dies or forms are necessary, and the cost will then approach, and possibly exceed, that of a monolithic concrete construction, except in the case of low buildings, in which the walls do not carry much weight in proportion to their thickness. The appearance of concrete-block houses can be made interesting and possibly beautiful by modeling and courses, or by obtaining an individual texture, a texture which will not be an imitation of natural stone or of stamped steel ornament, which, unfortunately, forms the basis for most of the ornamental dies now on the market.

Fig. 9.—Walls of hollow tile plastered in pebble dash.

The ornament on concrete blocks is limited by the same difficulty which surrounds the manufacture of satisfactory stamped steel ornament, which is that the stamping does not permit sharp outlines or undercutting of the ornament, both of which are necessary to obtain an artistic play of light and shade. It is necessary to use a comparatively dry mixture of sand, cement, and water to produce the blocks rapidly; such a mixture is porous, and is the cause of the spotty and water-soaked appearance of a cement block house after a rain-storm.

Hollow Clay Tile.—Hollow clay tiles are made of varying thicknesses, usually 12 by 12 inches, and 3, 4, 6, 8, 10, and 12 inches in thickness. Those thicker than 8 inches are usually termed "wall blocks." Well-burned clay tile does not disintegrate in moist or damp places. They are suitable for use for buildings of any kind where the unit stresses are not too great. Special blocks for high unit stresses can be obtained, so that this form of construction, supporting fireproof floors, can be used for buildings having as many as five stories, and is shown in Fig. 9, photographed from material made by the Laclede Christy Co., of St. Louis, Mo.

The exterior walls in colder climates—that is, in localities north of a line approximately on the 30th degree isotherm for January—should have a hollow space to retard the loss of heat and to prevent the discharge of moisture through the walls into the building. Such spaces are formed by furring the inside of the building with hollow clay tile or hollow gypsum boards, also by the use of metal furring, all of which is described in another paragraph.

The webs of the hollow building blocks appear to transmit heat to such an extent that moisture is condensed on the inside or outside of walls built of such blocks opposite the webs when the conditions are favorable to condensation, unless the inner surface of the blocks is sealed or protected by bituminous or asphaltic compound. Hollow bricks are sometimes used for the inner course of brick walls, but the same objection holds in their use.

FLOOR CONSTRUCTION

The invention of reinforced concrete and reinforced tile construction has produced a fireproof construction which increases the cost of a hospital only from 10 to 20 per cent. above the cost of one in which wood-construction floors are to be used, depending on the kind of floor surfacing selected.

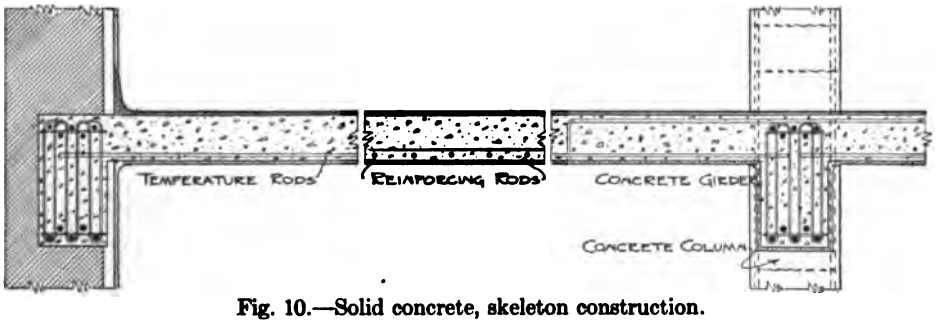


Fig. 10.—Solid concrete, skeleton construction.

High steep roofs of fireproof construction are expensive, requiring special forms which are used only once, more material than a floor, and an expensive covering, such as slate or tile. Where a roof of such a form is considered an esthetic necessity, and money is not on hand to build it of enduring construction, it should have steel framing and 2- or 3-inch thick planking, approximating mill construction, with an unobstructed attic cement-finished floor below it, sloping to outlets in the outer walls, thereby affording protection from storm water to the lower stories in the event of a partial destruction of the roof by fire.

The most popular forms of fire-resisting construction are the following, viz.:

(*a*) *Reinforced Concrete Flat Slabs* (Fig. 10).—Its cheapest application is for comparatively short spans, probably 15 feet is the economic limit, the thickness

will vary from 4 to 6 inches; transmits sound easily if covered with a hard floor; plaster adhesion to smooth cement surface is not certain; only small electric and gas pipes can be embedded within the concrete; plumbing and steam pipes not only weaken the floor on account of their size, but must lie free to expand and contract, consequently pipes hanging from such construction must be concealed by suspended or false ceilings in certain rooms, inasmuch as laying plumbing pipes on the construction and raising a bath-room floor not only increases the cost, but the steps which are then necessary at a bath-room door are very objectionable.

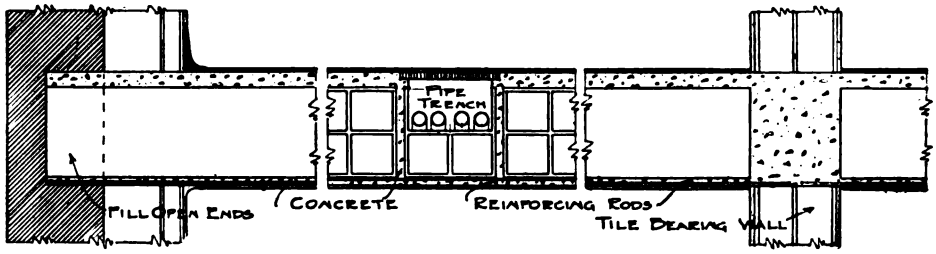


Fig. 11.—Johnson type, tile and concrete, bearing walls.

(*b*) *Reinforced Concrete Ribs and Slabs* (Fig. 11).—When the spans are too great for an economic use of flat slabs, ribs or beams of greater depth are introduced, spaced at intervals to obtain thin slabs and beams of proper proportion; this form of floor is subject to the same objections as noted under type (*a*), but to the further objection that the ribs cannot always be spaced symmetric to the walls of a room and also obstruct light; if a metal lath-and-plaster ceiling is suspended below such construction its cost is increased considerably above that of some of the flat ceiling constructions described below.

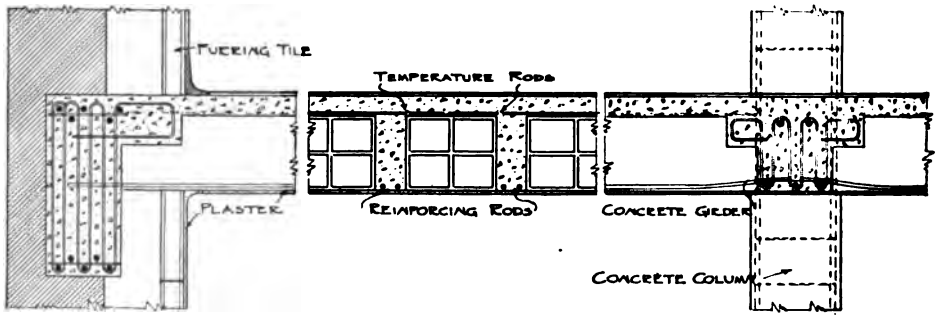


Fig. 12.—Concrete, rib, and tile, skeleton construction.

(*c*) *Tile and Reinforced Concrete.*—The kind shown in Fig. 12 contains a woven wire fabric in the lower layer of concrete in short spans and rods in longer spans; it also requires a strong concrete layer on its upper surface, firmly united to the tile; it is a fairly economic construction; it affords considerable resistance to the transmission of sound and presents a flat ceiling.

The objections to this form of construction are that the surface to be plastered is concrete, and that certain stresses must be transmitted through the tile to obtain a safe floor. This is obtained by the mortar bond and is not certain to occur everywhere.

(*d*) *Reinforced concrete rib and tile construction* (Fig. 13) shows that this form of construction consists of two parts: the reinforced concrete joist and the hollow tile between; this is only a filling, and may be cut out or formed into channels for the reception of pipes and conduits. It requires very simple forms for erection, affords a flat ceiling resistance to the transmission of sound, a good surface for plastering, and space for the reception of piping of the size ordinarily required. If an unusually large space is required it can be formed as shown in the illustration.

Steel and Tile.—Steel beams and girders, connected together into a floor system, or combined with columns into a skeleton steel construction, are too well known to require description.

In the best form of this construction (Fig. 14) the spaces between the beams are filled with hollow clay tile, or sometimes concrete is used, but unless the arrangement of the building is unusually simple and the price of steel abnormally low none of these forms of construction can approach the other four types described above in point of cheapness, and can never do so if there are men trained and experienced in reinforced concrete construction in the field.

Types (*a*) and (*b*) are very useful for rooms and first floors which are not over sleeping or living apartments, but the types should be the same throughout a building, to permit of the frequent use of one set of forms.

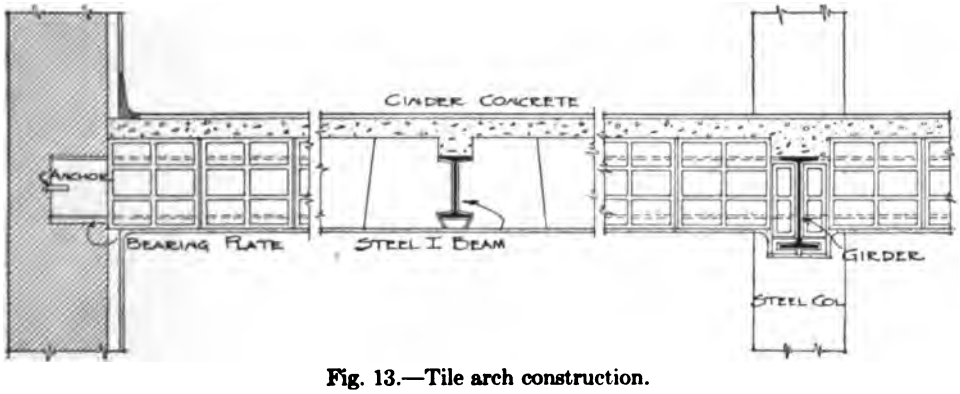


Fig. 13.—Tile arch construction.

A finished cement surface can be obtained with types (*a*) and (*b*) at a slight additional cost; therefore suitable for laundries and storerooms.

The four types are drawn to be suitable for linoleum or magnesia-cement floors, or the kind of wood flooring which is secured to the cement by asphalt and bitumen, described in a later paragraph.

Where ordinary wood flooring is described it is necessary to lay wood-nailing strips in a meager concrete, such as cinder concrete, on any of these types.

Skeleton concrete construction or wall-supported floors may be combined with any of these types, but their choice is an engineering question in which height of building, thickness of walls, and cost of walls are important factors too intricate and involved for the scope of this work.

The much-advertised systems of construction afford some one an opportunity to obtain a much higher price for reinforcing steel, because of a valueless change of shape than for the ordinary stock shapes of the steel trade, or some one is obtaining engineering services and working drawings from a "System Company," thereby stifling competition and permitting the "System Company" to recover the cost of the engineering services in an excessive unit price of the steel or an

unnecessary quantity; the cost of advertising and engineering must be paid for somewhere, and will increase the cost of the building, because it will be paid by the owners in one form or another.

To permit contractors who are in the same position as tradesmen to write specifications and make any portion of the plans is pernicious and often immoral. Such conduct of constructive work permits irregularities and should not be tolerated. The architect should be paid a fair commision, but he must be what the title implies, competent to analyze the situation, form proper conclusions, and design the whole of the work, so that bona fide competitive proposals will be submitted by the best and most reliable contractors in the field.

Fig. 14.—Steel and tile construction.

The architect who has had the most experience and the best training will obtain the most for the money expended, and notwithstanding his commission may be more than that asked by others, he will return it many times in a more suitable design.

The old saying that the highest-priced man usually is the best is as true in building as in many other human activities.

ROOFING

The slope or pitch of the roof depends on the design and the available funds. Steep pitched roofs which are visible and ornamental must be covered with slate, tile, or copper laid with ornamental seams. Such roofs are so well known that

they require no description. Stamped tin, galvanized iron, or copper shingles are offered in imitation of molded roofing tile, but, inasmuch as they are an imitation and represent something which they are not, they are an esthetic abomination. They are no cheaper than a well-made metal roof, and, inasmuch as they must be painted, they present no advantage over the older form, and have the disadvantage of enclosing surfaces which may be attacked by moisture and cannot be reached by the paint brush.

The ordinary felt and composition roofing requires no description, and if laid by an established and reliable roofer, who is paid a fair price, such roofs have a long life. Their weakest point is in the junction between the roof and the walls. Heretofore this has been made tight by inserting a strip of wood into the wall, and securing the felt to the same by a wooden cleating strip, covering the whole with tar and pitch. The air being thereby excluded from the wood, this is subject to dry rot, and, inasmuch as the gravel cannot stand on the vertical surfaces, the volatile oil in the tar, pitch, and roofing felt is soon distilled by direct sun-rays, so that the roofing becomes brittle and nails lose their hold. This objection has been largely overcome by a new form of clay tile block having a groove, into which the felt is wedged, and termed a "raggle block." When, in combination with this block, the angle between the roof and wall is rounded off, a permanent device has been substituted for the vulnerable point. Few of the many kinds of prepared roofing now on the market are as good as a good felt composition and gravel roof. Their reason for existence is largely the lack of skilled labor in small towns or remote localities, where there is not sufficient work to employ composition roofers constantly. The special roofs containing high-grade felt or burlap in combination with asphaltic compounds are excellent, and the companies manufacturing such material will send their experts to lay such roofs almost any distance if they are of sufficient size.

A roof to be used as a promenade or roof garden must have a special surface; level wooden floors with open joints blocked up on the roof are often used, but these are not only a fire hazard, but objectionable on account of loss of small articles through the open joints, rotting of the wood, and odors from the enclosed space.

Monolithic Portland cement roofs, reinforced to guard against cracking from expansion, contraction, or unequal settlement, and having a waterproofing compound in the top dressing, may be used without any other roofing beneath if the dimension of the roof between the walls is not large, but as the size increases the danger of cracking increases, and if such slabs form the full thickness of the roof condensation will gather on the ceiling below in cold weather, which will drip to an annoying extent. Roofs must be insulated to retard the rapid loss of heat, either by the use of a hollow tile construction or the forming of an attic space, the temperature of which would be a mean between the room and the outdoor temperature, or by a filling of dry cinders on the structural portion of the roof. It is usually more economic to build a horizontal roof construction and obtain the pitch necessary to drain storm-water by a filling, provided the roof is a composition roof having a pitch of about $\frac{1}{2}$ inch vertical per foot horizontal measurement. When filling of this kind is used the upper surface should be compacted by rolling, and covered with a 1-inch thickness of strong Portland cement mortar to provide a firm foundation for a felt and composition roof. If the roof is not to serve as a garden, the felt should be covered with screened gravel as for any other composition roof, but if it is to serve as a garden, it should have six thicknesses of felt everywhere of 6-ply, then mopped with hot asphalt compound and covered with a layer of flat red tile made for this purpose in Akron, Ohio, and measuring 6 by 9 inches, 1

inch in thickness, and scored with deep grooves on the underside, which assist the adhesion of these tiles to the roof. Such tile are laid with a sliding movement, forcing the compound into and over the joints; the excess of material is cut off after a few days. Such roofs have an attractive appearance and usually require no repairs for twenty to twenty-five years.

Small cement tile or cement work like sidewalk work may also be used in the same manner, but, inasmuch as the Akron tile are impervious, it is more certain of leading all storm-water to the gutters and conductors. The comparative cost of different kinds of roofing are as follows, and based on the square of 100 feet (10 by 10):

Variegated green and purple slate	$13.00
Black slate	15.00
Five-ply felt and composition roofing	5.00
Portland cement slabs on 6-ply felt for roof gardens	21.00
Flat red terra-cotta tile on 6-ply felt for roof gardens	24.00
Tile roofs, interlocking red tile	19.00
Interlocking green dull glazed tile	27.00
Interlocking green high glazed tile	29.00
Red Spanish dull tile	22.00
Green Spanish high glazed tile	34.00
Red shingle tile	23.00
Dull glazed shingle tile	30.00
High glazed shingle tile	32.00

FLOOR SURFACINGS

The requisites for a satisfactory floor for hospital purposes are many. The floor should be impervious, it should be monolithic or jointless, elastic, noiseless, non-slippery, of pleasing appearance, easily cleansed, and economic of maintenance. It is almost impossible to find a floor which will have all of these qualities.

Wood.—The cheapest serviceable floor is a matched hard maple floor, $\frac{13}{16}$-inch thick, and having a face from 2 to $2\frac{1}{4}$ inches wide, tongued and grooved on the edges as well as on the ends, also bored for nailing. Such flooring, including labor of laying, nails, scraping, shellacking, and varnishing two coats will cost about 10 cents per square foot, and to this the cost of nailing strips and cinder concrete filling between such strips must be added. The strips used are of hemlock, 2 inches thick and 4 inches wide, beveled on both edges, so that the concrete filling will hold the strips and prevent these from rising. The cost of the strips and concrete filling is about 5 cents per square foot, and this cost of 15 cents must be added to the cost of subconstruction if ordinary wood flooring is used. Slash-sawed southern yellow pine splinters and is unfit for flooring, and such wood must be quarter-sawed to make a satisfactory floor. Its cost is then about the same as the maple flooring described, but not as serviceable. It has the further disadvantage of not retaining a varnished finish as well as other hard woods, and apparently the great quantities of resin do not combine permanently with shellac and varnish.

Oak flooring of the same dimensions, and manufactured in the same manner as maple flooring, is well known, and there are the same objections to its use; the cost is about 2 cents per square foot more than the maple for plain oak floors, and there will be a larger proportion of short pieces, from 2 to 4 feet in length.

High-grade oak flooring, such as quarter-sawed white oak, costs from 5 to 6 cents per square foot more than maple flooring, but plain sawed is fully as serviceable as quarter-sawed.

Wood is slashed, or plain sawn, when the log is cut into boards by parallel saw cuts; quarter-sawed wood is obtained by sawing a log into four equal-sized pieces by two saw cuts at right angles to each other, and each of these quarters cut into smaller pieces by cuts parallel to radii.

The general objection to wood floors is the cost and difficulty of maintenance, also the large number of joint openings, which increase in size as the wood ages, and form innumerable recesses which cannot be cleaned and which may harbor objectionable germs. It is also difficult to join wood floors to coved bases and the bases to the walls.

Only varnishes of the very best quality will wear satisfactorily, and then only for a comparatively short time, and to maintain such floors in proper appearance requires a continuous expense for labor and for costly varnish. The varnish is quickly destroyed by use of hot water, soap, and brush, and nothing destroys the finish of the floor more quickly than an industrious scrub woman. It is well known that tepid water, with a light soapsud and a rag, will remove dust and dirt from a varnished surface without attacking it. This is rather slow work, and it appears to be impossible to have the help available for such kind of work pay any attention to this requirement.

Maple floors can be finished in a fairly satisfactory manner by giving them coats of boiled linseed oil mixed with turpentine and japan. The first coat will soak into the wood, and in drying quickly fills the pores, so that a second coat will dry on the surface similar in appearance to varnish, but not as durable. Oak floors should be filled with a mineral filler in hospital use to close the numerous pores, shellacked one coat and varnished two coats. A very serviceable and comparatively inexpensive finish can be obtained on oak by rubbing the wood, after filling, with boiled linseed oil and pumice stone. This will leave a velvety, dead finish, which can be constantly maintained by the house service, and can be walked on immediately after completion.

The oak and maple flooring will stain from water if wet before it is treated with oil or varnish. This is especially the case with oak, so that if the varnish is scrubbed off the oak will turn a blue black, and its original color cannot be regained except by scraping away the wood to a considerable depth.

A form of wood flooring which is used considerably in European hospitals, and also in some American institutions, consists of pieces of oak about 18 inches in length, tongued on one side and one edge, and grooved on the other side and edge, so that these pieces can be laid together in herring-bone pattern. These strips are molded in various forms of dovetailing on the underside, according to the respective makers or patentees. Such material is laid in hot asphalt or bitumen, which is spread upon the floor in a thin layer, and each piece is successively pushed into place, forcing some of the bitumen into the joints and filling these to the surface; the excess is cut off, and the floors then planed and scraped by hand or polished with an electric floor surfacer. Such floors do not have the objectionable open joints, but the difficulty of maintaining a satisfactory appearance is fully as great as it is with other wooden floors, but it is likely that this difficulty will soon be overcome by the use of oiling machines, designed similar to carpet sweepers and electric rotary polishers. The floors laid in this manner cost about 25 cents per square foot, and if a building is of reinforced concrete construction, an additional 4 or 5 cents per square foot must be spent to prepare a smooth surface on the structural concrete. If the building is of hollow tile fireproof construction, from 9 cents upward for a thickness of about 3 inches must be expended to prepare a surface suitable for laying such a herring-bone floor. The junction with the walls

is fully as difficult with this kind of flooring as with other wooden flooring, and it will probably be necessary to employ a coved base of magnesia cement, which will be described later.

Linoleum has been found to be fairly satisfactory when used in the ordinary thicknesses and laid in the ordinary manner, but when this material is used in the heavy grade known as "battleship" linoleum, and cemented to the foundation, it is a very superior floor, filling almost every one of the requisites of a perfect hospital floor. The foundations should be trowel-finished Portland cement, made about ¼ inch, or the thickness of the linoleum below the edge of the baseboard. This form of flooring has been in use in some of the large hospitals of Germany for several years, and will probably crowd out every other form. In that country the material is laid on the floor loosely and allowed to expand, contract, and accommodate itself to the new condition, and is then cemented solidly to the foundation with a glue or cement, and is weighted down with innumerable iron weights and bags of cement while the cement is setting.

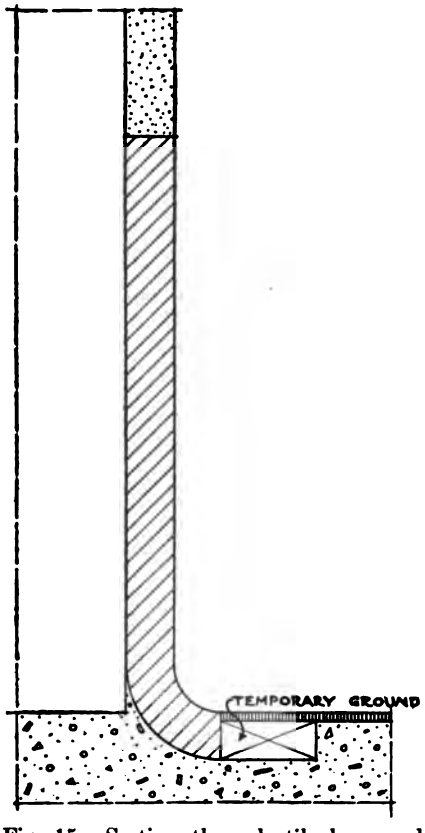


Fig. 15.—Section through tile base and linoleum floor.

After the work is completed the floor is perfectly true, without wrinkles, and does not give out the objectionable hollow sound heard when walking on linoleum which is only tacked down. Such linoleum costs approximately 15 cents per square foot cemented in place, and also requires a trowel-dressed Portland cement foundation, so that, if the construction is reinforced concrete, an additional charge of 5 cents per square foot over and above the cost of the structure must be paid, and if the building is of hollow tile construction, an additional cost of 9 cents and upward per square foot must be added. Inasmuch as the so-called sanitary cove at the intersection of the floor with the walls is desirable, an artificial marble or magnesia-cement baseboard and cove should be used (Fig. 15). Attempts have been made to cover a cement cove with the floor linoleum, curving this to the cement upward to a steel corner bead, forming the division between the plastered wall and the floor linoleum. This could be done fairly well adjoining the straight walls, but it is unsatisfactory in both re-entrant and salient angles. It will be seen that the salient angles must be filled with a small patch of linoleum, or a cement such as magnesia-cement, but the result is not as perfect a piece of work as a combination of linoleum floor and artificial marble or magnesia-cement baseboards, as shown in Fig. 16.

There is a plastic linoleum recently come on the market which promises a good deal as a substitute for "battleship." The floors of the new New York Post Graduate

School Hospital are made almost exclusively of it, and the effect is very attractive. It is simply a composition identical with "battleship" linoleum, the only difference being that the mixture is made up like any concrete at the time and place where it is to be used. It requires exceedingly careful troweling if it is to look well. It can be made up practically in any solid color. In the same hospital the laboratory work-table and bench-tops are of the same material. It has hardly been in use long enough anywhere to tell whether it is to be a permanent form of flooring. McKim, Mead, and White, the New York architects, think well of it.

Portland cement does not make a satisfactory floor except when special materials and special workmanship are applied. When the troweling has been perfect, and continued to the extent that the surface is glazed, the softer particles will soon wear away at doorways and other much traveled places, so that the harder grains of sand will project and show a surface similar to sandpaper, and these portions will soon have a different texture and color from the floor at walls and under

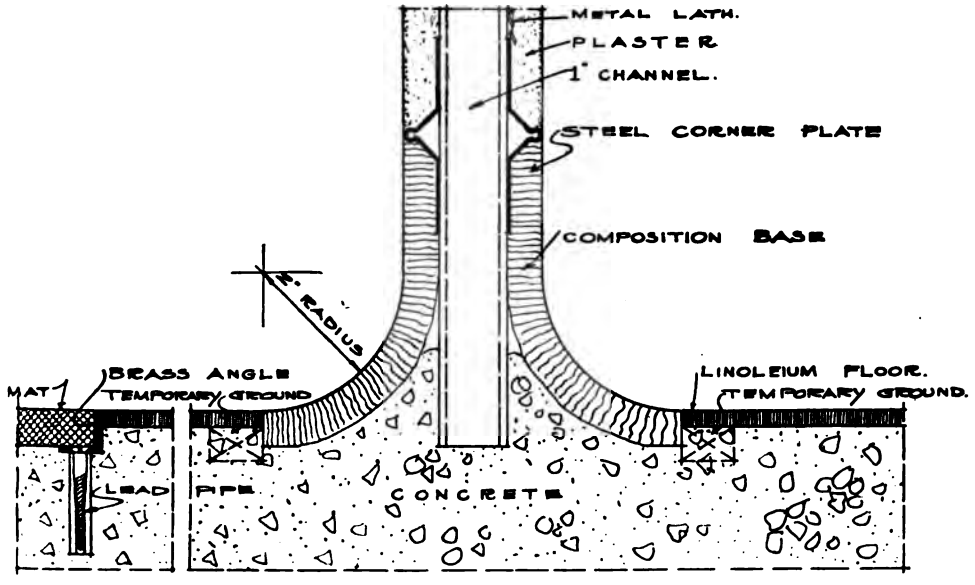


Fig. 16.—Steel corner plate between plaster of wall and composition base.

tables and beds and other pieces of furniture. Portland cement is not hard enough uniformly to resist hospital wear. Such floors can be given a finishing of special cement floor fillers of solid colors—Pompeiian red, sage green, deep buff, and gray—and if the cement has been troweled with great care, to bring it to a true smooth surface, these colorings will produce a floor of good appearance, but, inasmuch as the finish is practically on the surface, it will not last much longer than the varnished and painted surfaces of wood, and must be renewed from time to time.

Such floors are quite serviceable for rooms which do not receive much usage, as trunk-rooms, patients' locker-rooms, morgues, and small chapels, used only for funeral services. White Portland cement can be obtained, and if white sand is used a nice appearing floor can be obtained at a comparatively low cost, but all monolithic floors of Portland cement and Terrazzo have the disadvantage of cracking in unexpected places and in unexpected directions. This is probably due to the different ratios of contraction between the floor and the substructure or to a varia-

tion in the settlement of the building. Portland cement is not elastic like asphalt or wood floors; it is more like glass, and when pressure is exerted it will break. Inasmuch as Terrazzo floors are only Portland cement floors with chips of marble used as the aggregate of the surface, such floors crack in a similar manner to cement floors. Cement floors can be laid in squares, and Terrazzo floors should be divided into small fields by the use of strips of marble, so that if there is a tendency to crack it will occur in these joints or along these strips, since they offer the least resistance. All floors of the tile form have the advantage over the Terrazzo of dividing the shrinkage or cracking along the many joints in an irregular manner, so that cracks are seldom noticeable in floors made of tiles.

Terrazzo mosaic floors cost approximately 25 cents per square foot, and the cove bases can be laid monolithically with such floors. The plinths for casings, steps, and all kinds of projections, and the variation in the wall or floor surfaces can be easily made with the floor and the junctions coved together at a comparatively low expense. These floors can be ground to fairly smooth surfaces by rubbing with sandstone blocks, and portions which it is desired to polish can be polished with electric polishing machines. It is rather difficult to run the bases true against the wall in place, and the better contractors prefer to make the cove bases and plinth blocks in molds in their shops and there grind the edges straight on rubbing beds, rub and polish the cove by machinery, and set these against the wall on the floor before laying the Terrazzo floor.

The mosaic floors cost considerably more than other floors described, and are usually used only in the portions of hospitals which are intended to be more ornamental, such as the vestibules, entrances, and chapels. There are marble mosaic floors and ceramic mosaic floors, and these cost from 55 cents a square foot upward. The marble mosaic floors are more expensive and more beautiful in coloring, the colors being softer and blending together better than the opaque pottery colors used in the ceramic material. The cracks mentioned in connection with Terrazzo are also frequently noticeable in marble or ceramic mosaic floors, and are due to unequal settling of the building and different ratios of contraction between the floor and the substructure. Coved bases of marble, glazed tile, artificial marble, or magnesia-cement can be used in connection with such floors.

Chemical solutions and scrubbing in operating- and dressing-rooms in time destroy these floors by action on the Portland cement in their composition.

A kind of flooring related to Terrazzo and marble mosaic is called *tutti colori*—or many colors. It is made by scattering the colored marble chips used in making marble mosaic flooring indiscriminately into a cement field so that the pieces fit together irregularly; this is rubbed with rubbing stones similar to Terrazzo, and any of the forms of base described can be used. Tutti colori costs about 35 cents a square foot, and has the same faults as Terrazzo. Artificial marble tiles are very durable, satisfactory, and economic floors, suitable for kitchens, pantries, toilet-rooms, and the like. These tiles are made about 1 inch in thickness, either square, hexagonal, or oblong, in hydraulic machinery. They have a wearing surface of colored marble chips and a backing of Portland cement and screened stone. These tiles are about 9 inches square, and allowed to set under favorable conditions so the cement becomes dense and hard. They are then ground on a rubbing bed in the shop and set in the building similar to any other form of tile. They can be made in any coloring and any design. Some of these are pleasing for use in an entrance hall. Such floors cost about 42 cents per square foot, and the bases, 5 inches high, about 60 cents per lineal foot, and have the advantage of not showing cracks, of being truer and denser than Terrazzo. Coved bases, plinths, and stairs are made

in the same manner in the shop, and the walls and partitions should be prepared to receive them in the same manner as described for magnesia-cement floors; a design for stairs made of polished artificial marble of this kind is illustrated in the section describing stairs. Such flooring, used as a border in corridors with coved base and plinths of the same material, and a runner strip 5 or 6 feet wide down the center of the corridor, made by laying a smooth cement floor about ½ inch lower than the surface of the artificial marble tiles, and filling the runner strip with "battleship" linoleum cemented into place, will make almost an ideal corridor floor.

Anything harder than linoleum, cork carpet, rubber, or cork is too noisy for a corridor.

The well-known **encaustic tile floors** cost about 45 cents per square foot, but are little used at the present time, and do not appear to be in favor, according to the passing fashion of the day. These tiles are made in pleasing colors, but they break quite easily and sometimes separate from the foundation, so that walking over a defective tile floor produces a rattling sound. This is probably due more to improper laying than any fault in the material. If the tiles are well soaked, and genuine Portland cement used, such tiles ought to have a foundation so firm that they cannot break under ordinary usage or become loose, but there is no tile cove made which has not the objection of being in small pieces, so that an artificial marble or magnesia-cement base should be used in connection with such tile.

Ceramic tiles are very dense, flinty pottery, and absolutely impervious. The surface is slightly gritty, so that they are not slippery, and when used in the larger sizes such a floor is one of the best for operating-rooms. These tiles can be obtained in 2-, 3-, 4-, and 5-inch hexagons, also in squares of the same dimensions. The one fault of this kind of flooring is that the tiles must be set in a pervious mortar joint, which forms a network over the entire floor and which cannot resist scrubbing. In time these joints will be considerably lower than the surface of the tile, become dark, and sometimes black. Either artificial marble coves and plinths or genuine marble or magnesia-cement should be used in connection with such floor.

One-inch thick **white glass** can be obtained and has been used for operating-room floors. This material is ground on the rubbing bed, similar to plate glass, to a true, slightly gritty surface, and is beautiful in appearance. The coves and plinth blocks can be made of the same material and these can be polished if desired. The material costs approximately $2 per square foot. It is not advisable to lay pieces larger than 18 by 30 inches on the floor, for it becomes too difficult to bed large pieces so perfectly that there will not be places without bedding. It is obvious that a piece which is not perfectly bedded will crack very easily.

Slate, at about 70 cents per square foot, white Italian marble, at 80 cents per square foot, gray Tennessee marble, at 90 cents per square foot, make good serviceable floors, and the sizes of the pieces are subject to the same limit as heavy glass. The slate is very dense and impervious, but its dark appearance is not suitable for an operating department. The Italian marble is not sufficiently impervious. The light gray or pink Tennessee marble is very dense and a very serviceable floor. Its color is such that it does not show the tracking of footsteps readily, and may be objectionable in a hospital for this reason.

Rubber floors cannot be obtained for less than $1 per square foot, except where very large quantities are used, and this kind of flooring requires a special cement foundation similar to that described for linoleum, so that its cost is almost prohibitive in a hospital of moderate cost. The rubber comes in tiles usually of an

interlocking pattern, in a variety of opaque colors, and can be laid in pleasing patterns, but rubber coves are not good, and it will be necessary to use one of the forms of cove described with the tile floors.

Compressed cork is one of the newest materials on the market, has a very pleasing, warm color, similar to English oak or tobacco brown. It is elastic and noiseless, and the makers claim that it will not wear out. It must be laid on a cement special foundation, composed of sawdust and Portland cement, which costs about 8 or 9 cents per square foot, depending on the thickness. The cork flooring can be obtained in different sized squares 3 by 3 inches and 9 by 9 inches and in different shades, so that it can be laid in a variety of patterns. The manufacturers also offer a cork base cove and plinth blocks, and show how it can be used for the treads of stairs, and, inasmuch as it is not slippery, it makes an excellent stair tread. The material in large quantities costs about 85 cents per square foot. Its chief disadvantage is that it is probably not sufficiently impervious to septic matter and micro-organisms, as most other floorings.

Magnesia Composition Floors.—These floors are known under various trade names, such as Asbestolith, Karbolith, Monolith, Flexolith, Magnasite, and Dolo-ment. They are composed principally of pure ground magnesia and other ingredients, which are trade secrets. Some makers use hardwood sawdust, others short fiber asbestos or quartz sand, and possibly many other materials. The flooring, when well laid and properly maintained, has almost every one of the requisite qualities of a good floor. It is applied in the plastic state, so that it is jointless. The baseboard and cove can be made monolithic with the floor. The material can be applied around bases of all pieces of furniture, columns, and into plinths for door trim. If the mixture is not too rich or too hard in itself the flooring has some elasticity, is not as noisy as wood, tile or mosaic, is less slippery than these, can be colored and be pleasing in appearance, and, inasmuch as there are no joints or crevices, can be easily cleaned.

The completed flooring should be treated with an oil in order to preserve the depth of coloring and finish. The oil also protects the material from water. The material is not suitable for places where water is used freely, or where water is allowed to drop on it, as in the douche room of the hydrotherapeutic department; it can be easily cleaned by wiping with a cloth moistened in tepid water and a light soapsud, but should not be scrubbed with a brush, for the stiff bristles will loosen particles of the surface in time and change the floor from a smooth to a pitted surface. The material is probably not suited for operating- and dressing-rooms on account of the use of chemical solutions and the necessary frequent scrubbing. The efficiency and durability of a magnesia composition floor depends not only on the quality of the material used, but on the most careful proportioning of these materials and perfect troweling. The work must be laid by mechanics skilled in this class of work, and these are difficult to find. Workers of Portland cement believe themselves capable of executing such floor work, but they require considerable practice before becoming skilled. If the troweling is not carefully done and properly executed, the floor will have a very wavy appearance and a surface of unequal texture. The material appears to be so easily used and applied that many inexperienced persons are offering to-day this class of work, with the consequent result that there have been many more failures than successes. Some of these floors have shrunken to such an extent that they were obliged to crack, loosen themselves from the foundations into irregular-shaped pieces, and consequently rattle and rock when walked upon. Others have been so soft that the floors disappear in patches, exposing the concrete foundation. When such work

is required it should be given only to established concerns, having had years of experience and successful work for satisfied customers, to which prospective customers can be referred, and, in the case of firms meeting such requirements, it would be well to exact a carefully written guarantee for not less than eighteen months.

Magnesia composition floors are practically well adapted for use in buildings of reinforced concrete construction, inasmuch as the floor construction proper serves as a foundation for the composition without special finishing and troweling of the concrete surface, such as must be supplied when linoleum or cemented wood flooring is used. The cost of magnesia composition floors approximates 25 cents per square foot, and coved 8-inch high baseboards approximately the same amount per lineal foot. Measurements should be taken from wall to wall for the flooring and the baseboards added as a separate item. The material can be laid in patterns and borders by the use of brass dividing strips, filling the various spaces with different colored or tinted composition.

BASE COVES

The several kinds of flooring described have each a base cove most suited for the purpose. It is recognized that any surface having a horizontal projection will catch more dust than vertical surfaces. Also that re-entrant angles require considerable labor to remove dust from them, so that the omission of re-entrant angles

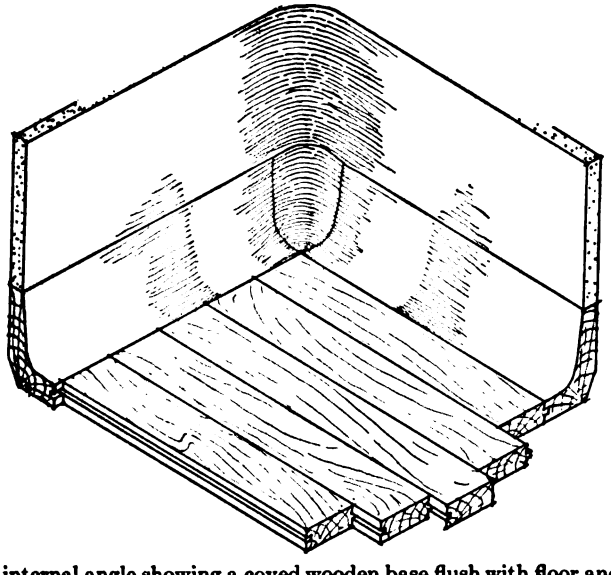


Fig. 17.—An internal angle showing a coved wooden base flush with floor and plaster. Notice the corner block which must conform to the radius of the plastered corner coves, and is made by quartering a turned wooden cup.

and horizontally projecting surfaces from the walls of a room reduces the labor of cleansing. The old forms of projecting baseboards offered a lodging place for dust on each one of the horizontal or slanting surfaces of the molding, and the junction with the floor formed an internal angle difficult to clean, and the hard scrubbing required thereby removed the finish from the baseboard. A curved

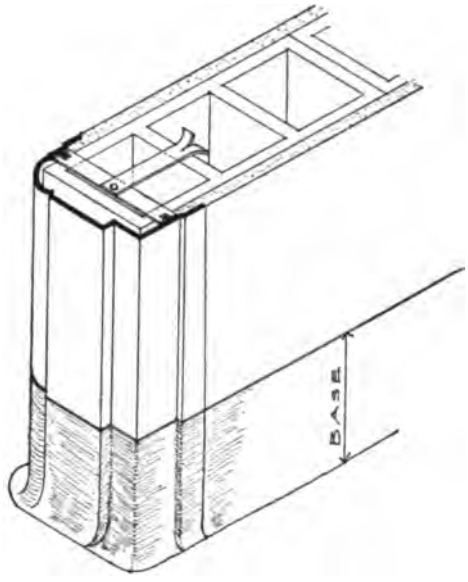


Fig. 18.—Artificial marble base fitted to rolled steel combined frame and door casings

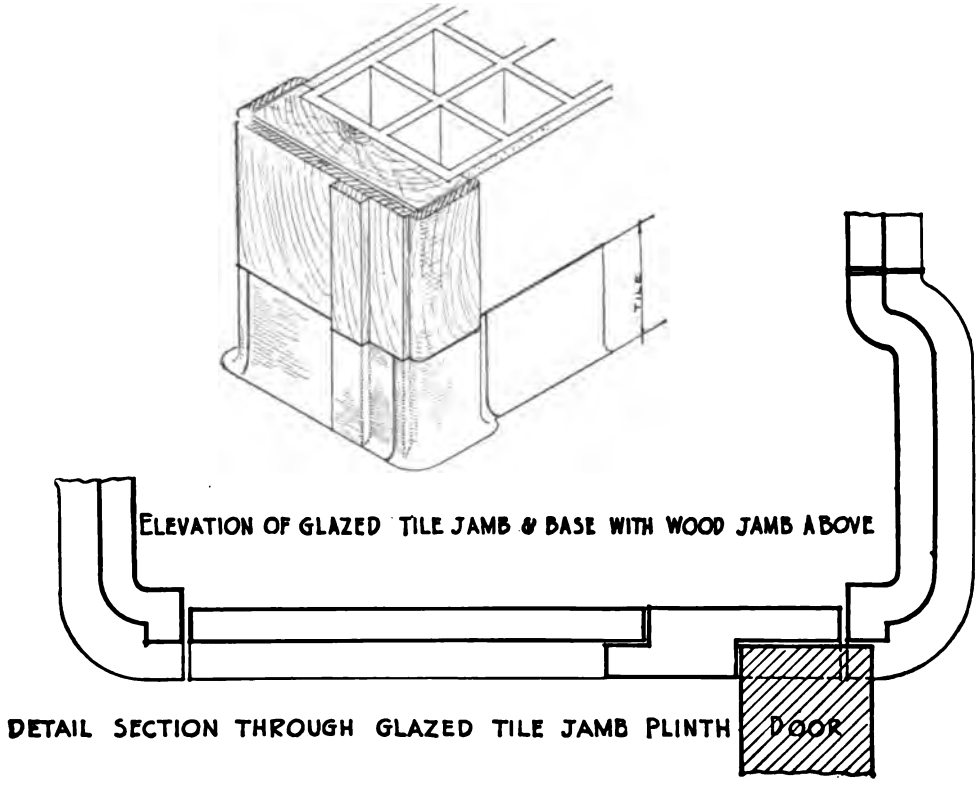


Fig. 19.

surface joining the floor with the wall is easily produced in cement and was probably first used with this material. It was an easy step to using Terrazzo mosaic in the same manner, but always with a projecting horizontal surface. The cove base was omitted in good work, but by nailing the cove on the floor and against the floor, making not only a horizontal projecting surface, but also an additional internal angle at the floor. All of these objections are obviated in modern work, and bases are flush with the wall and flush with the flooring. This can be done in woodwork, as shown in Fig. 17. A temporary wooden ground is placed against the wall for the plasterer, and removed when the carpenter is ready to set the coved wooden base. The same procedure can be followed wherever monolithic Terrazzo or shop-made artificial marble or natural marble, glass, tile, or cork bases are used (Fig. 18). When it is desired to use Portland cement or monolithic Terrazzo or magnesia composition bases it is best to have the lathers place a steel corner plate around the room at the top of the base line, and permit this steel corner plate to remain in place between the plaster and the Portland cement or magnesia composition base, as shown in the illustration. The details for joining the vertical cover of the plaster walls and the horizontal coves of the floor can be worked out easily by the architect. All cove bases should go to a full height of 8 or 9 inches above the surface of the floor, so that in mopping and scrubbing the walls will not be stained (Fig. 19).

STAIRS IN THE HOSPITAL

In cities the number and width of stairs are usually governed by ordinances, but, in any event, it is advisable to place stairs at all extremities of the building, for, notwithstanding that a building may be fireproof, smoke or an explosion may cause a panic, and stairs should be so placed that persons can escape by running from the fire. If the building is long and narrow and the central stair is a requisite for purposes of administration, there should at least be porches connected by stairways at the ends.

Almost every modified block or modified pavilion plan affords a number of corners not suited for room or ward purposes. The stairs can usually be placed in such spaces to good advantage to the plan and illuminated by skylights if the well holes are not too restricted.

Every stairway with the exception of monumental stairs should be enclosed to confine noise and to make them safe in the event of fire, and the enclosure should generally be of fireproof construction, and it is more necessary that the stairs be enclosed in fireproof construction in buildings of ordinary construction than in those of fireproof construction.

More privacy is also assumed by enclosing stairs, and assists in control of visitors.

The doors leading to such stairways should be of heavy wood or metal clad, easy of operation, and closed by door checks and springs. The base of each stairway should have a door leading directly to the exterior and close to the ground. It is best to have the stairways leading to the basement in separate enclosures, and that the stairways to the upper stories do not extend into the basement, inasmuch as fire is more likely to originate in the basement and may communicate to the upper floors through a stairway.

Stairs of wood are used only in comparatively small buildings, and it is more difficult to keep up their appearance than it is that of floors. Consequently, stairs are usually built of incombustible material which may be molded in the most desirable shapes and requires little or no expense for up-keep. Cast-iron and

wrought-iron stairs or a combination of these are comparatively low in price, but the treads become slippery quickly and they are exceedingly noisy. Such treads can be covered with linoleum glued to the treads and finished with a brass nosing, but the junction with the strings and risers form dirt-catching recesses.

The combination of iron supports with slate, marble, or magnesia cement treads are better, but they also have deeply recessed angles in the corners. Polished artificial marble made in the same manner as described for floor surfacing is one of the best and most economic stair materials. If used in combination with solid masonry walls such stairs can be self-supporting without the use of iron, except such is used for the balustrade. Figure 20 illustrates such a stairway. If solid

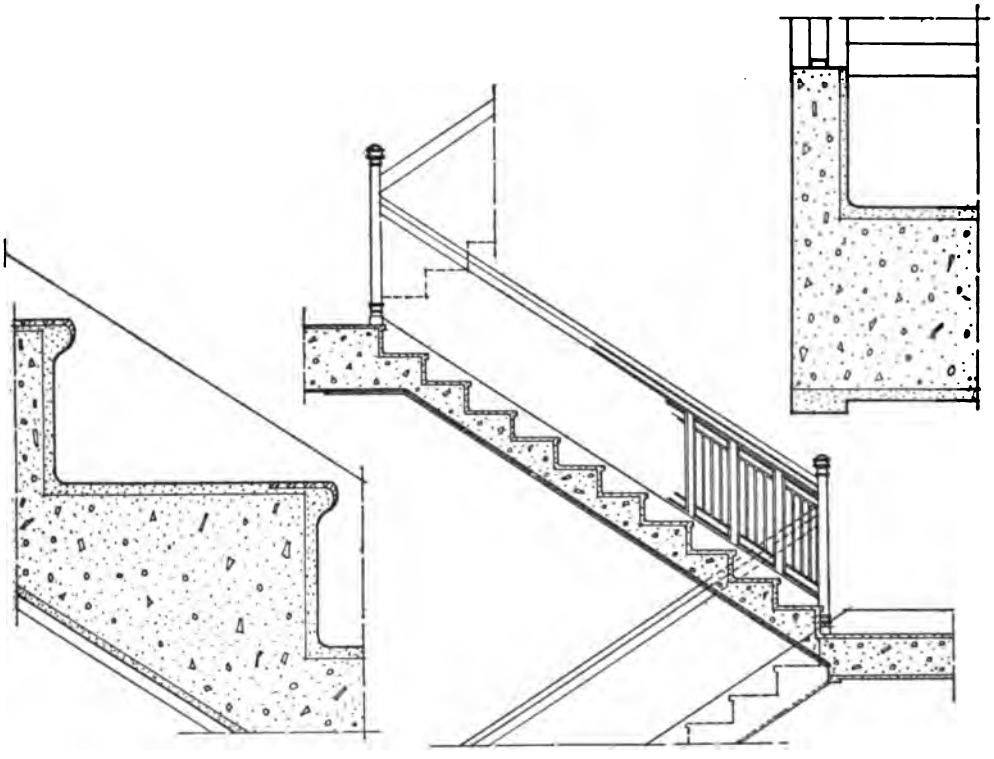


Fig. 20.—Scale drawing and details of reinforced concrete stairs with safety tread nosings and magnesia cement treads, risers and strings joined by coves in the angles.

masonry walls cannot be built, such a stair may be supported on steel supports or a reinforced concrete slab, which will require a plastered finish on the soffit, which is good, but not as attractive as a polished artificial marble surface. This material is easily prepared to receive specially made antislip nosings. Such nosings are usually made of a combination of lead and steel, or brass, or carborundum; all of these are both sightly and effective. On account of the cost these safety nosings are generally used in strips only about 3½ inches wide, countersunk into the stair tread. Stairs formed of reinforced concrete, plastered on the soffit, covered with magnesia cement on the treads, risers, and strings, and provided with a metal safety tread are economic, of very good appearance, solid, practically noiseless, and easy to clean, for all angles and corners can be coved.

The landing railings and stair railings should be higher than in the dwelling-houses and other buildings. The rule for dwellings is to make the top of the railing 28 inches above the step at the nosing, but in a hospital the railing should be 6 or 8 inches high, and at floor landings and other landings railings should be at least 4 feet high. In a children's hospital and in asylums it would be best to have stairways with solid masonry piers between the flights from the bottom to the top or balustrades about 6 feet in height with wooden hand-rails on metal supports at a convenient height.

PARTITIONS

Inasmuch as it is expected that only hospitals of fireproof construction shall be erected, combustible partitions will not be described. The ordinary forms of incombustible partitions are: first, gypsum blocks, 3, 4, and 5 inches in thickness and upward; second, hollow fire-clay tiles, 3 inches in thickness and upward; so-called solid plaster partitions, 1½ inches and upward in thickness; metal stud and metal lath-and-plaster partitions; gypsum stud and gypsum board partitions. Gypsum block partitions are sometimes known as mackolite. The blocks are usually made 1 foot wide and 4 feet long, of varying thicknesses, with several round longitudinal perforations reinforced with lath or rods, and made of gypsum. These partitions are good insulators against sound and heat, and cost, with plastering on both sides, approximately 17 cents per square foot. The hollow clay tile partitions are made 1 foot square, with perforations or rectangular cross-sections through them and the wall of tile about ⅝- to ¾-inch thick. These tiles are burned in kilns similar to brick and terra-cotta, and a 3-inch partition plastered on both sides costs approximately 19 cents per square foot.

Thoroughly burned clay tiles do not disintegrate in moist or damp places, and are suitable for use in situations where gypsum blocks are less satisfactory, viz.: laundries, steam-rooms, sterilizing-rooms, boiler-rooms, and in basements. Where plastering is not required, and whitewashing will be a sufficient finish, clay tiles are more suitable than the other partition described, and they can be obtained unscored, *i. e.*, smooth, for this purpose at a cost of about 9 cents per square foot erected.

Solid plaster partitions are made by using ¾- or 1-inch steel channel bars, stuck into holes in the floor and ceiling, and there secured by screws or staples. These are placed about 12 inches center to center, and a wire cloth, expanded metal, or other metal lath is secured to these studs by soft iron wire (Fig. 21). The metal lath is then given a thin coat of mortar. This upon setting has stiffened the partition considerably, and additional coats are then applied on each side and brought to a thickness of almost 1½ inches for the thinnest kinds. When this is done the partition is so stiff that the journeyman can use the necessary pressure to produce fairly true surfaces. These are then given thin coats or a finishing coat of lime, putty, or plaster of Paris. Such partitions cost about 17 cents per square foot. Inasmuch as electric outlets must have steel boxes, it is difficult to enclose these in solid plaster partitions of only 1½ inches in thickness, and it is necessary to make them 2 inches in thickness to conceal the box, and then it is further necessary to use a special mat-board for the switch or a flush electric socket. These partitions have a lower sound-insulating value than any of the other partitions described, but they have been used in a number of hospitals and have given fair satisfaction. There are partitions in which metal studs, made of specially formed sheet metal, are employed, and these studs have spike-like projections over which the metal lath can be stretched and secured by a blow with a hammer. Such partitions

have metal lath on both sides, which must be plastered with three coats of plaster, and, consequently, cost fully as much as a gypsum block or hollow clay tile partition, but they have the advantage of a continuous air space, and, therefore, a higher sound-insulating value. These partitions cost approximately 21½ cents per square foot plastered complete.

There are other partitions on the market, but not in very common use. One of these consists of strips of gypsum which are set upright similar to wooden studding, and to which 1-inch thick boards of gypsum blocks and jute are secured on both sides by plaster of Paris. In some localities these can probably be ob-

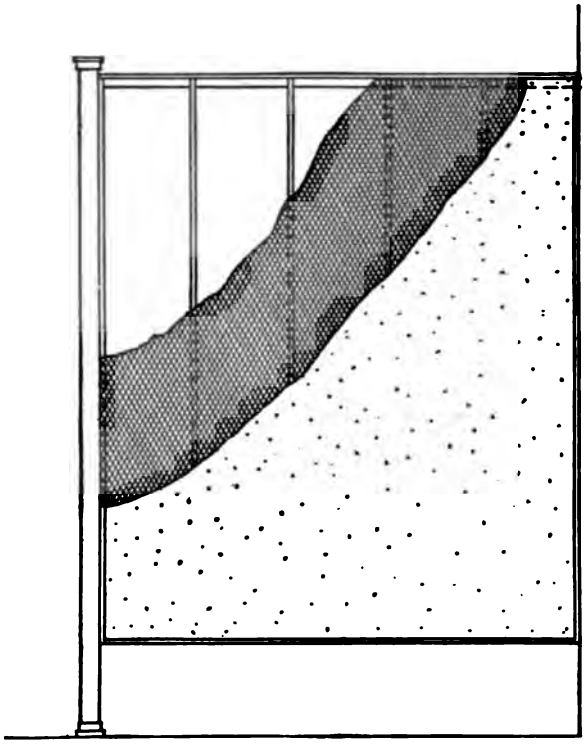


Fig. 21.—An elevation of a solid cement plaster closet stall partition. Notice the iron doorpost, steel top and bottom rails, vertical steel channels, wire bath or expanded metal wired to the channels and to plaster surfaces. The plaster surfaces are to be coved into the walls at the back of the stalls.

tained for less money than the gypsum blocks, and, inasmuch as they have air spaces, their sound-insulating value is fair.

Partitions are sometimes made of well-burned steam boiler cinders and plaster of Paris in the form of blocks, similar to gypsum block. This material can be made by mechanics on the site, and, if carefully made and properly dried out, makes a good and economic partition. Partitions are sometimes made by stretching wires vertically, horizontally, and diagonally in two directions, approximately 1 foot apart; board forms about 3 feet high on each side of these wires are set so that a space of 2 to 2½ inches will intervene between the board forms, and these forms are then poured full of mortar composed of plaster of Paris, sand, and cinders. As soon as the mass has set sufficiently to remain in place the forms are raised, and

the same procedure as before is continued until the partition is built close to the ceiling. It is obvious that a small strip near the ceiling must be filled in by a trowel from one side. In a building which need not be strictly fireproof it is permissible to use 2 by 4 inch wooden studding, placed 12 inches on centers and lathed on both sides with wire lath, each plastered with three coats of mortar. Such partitions cost a little more than the solid plaster partitions, but are somewhat more sound-proof. If particularly sound-proof partitions are required for special cases, it is advisable to build these double and with unbroken air spaces. The insulation may be increased by applying 1-inch cork boards against one of the partitions. The cork board can be in the space between the two or it can be inside of the inner partition, for it can be plastered with Portland cement fully as readily as any masonry surface.

It is obvious that to obtain a sound-proof room the room must have no rigid connection with any other part of the building, and any rigid connection from one portion of a hollow partition across the air space will carry some sound; likewise, sound will be carried through the floor underneath the partition or through the ceiling over the partition, so that this desirable quality can only be obtained in degrees proportionate to the increased expense. Some builders have advocated the use of rubber blocks under special sleepers and the joining of the two separate and distinct door frames, one in the inner partition and one in the outer partition, by flexible rubber strips. This can unquestionably be done and a sound-proof room can be obtained, but the expense of doing so will seldom be entertained by any hospital committee.

FURRING

Material built close to a wall or down from a ceiling to form an air space, to conceal constructive features or pipes, or to give semblance to constructive forms, as the imitation of a pilaster or a vault, is termed "furring"; as explained in the paragraphs on exterior walls, it is a necessary device in northern climates to prevent the forming of condensation and to diminish the loss of heat through the outer walls of a building.

Some of the waterproofing liquids on the market, composed of bitumen and water-glass, will seal the pores on the inside of the wall quite effectively, so that plastering can be applied directly on the brick, concrete, or other forms of masonry, and the makers claim almost as high an insulating value as any of the furrings described, but it is still questionable if this is a fact, and the cost of applying such waterproofing and insulating compounds is almost as much as the cost of furring the walls.

The air space is also invaluable, insomuch that it provides a space in which pipes of all kinds can be placed and concealed, without making the laborious process of forming or cutting channels in the brick tile or concrete walls compulsory. Such cutting is not only expensive, but often shatters and weakens a wall or pier. Furring is usually executed with the same kind of material used for the partitions.

Gypsum furring boards are made from 1 to 2 inches in thickness, and have ribs formed on their backs to obtain a thin air space. Clay tile furring is obtained by splitting 3-inch pieces into two equal parts along grooves formed in the blocks intended for this purpose, and made by the block-making machine before burning, resulting in a 1-inch air space.

Wire mesh, metal lath, and expanded metal is held away from the exterior walls by bands of crimped steel, which can be obtained in varying widths, $\frac{1}{2}$ to $\frac{3}{4}$ inches wide being the most suitable.

Where water-closet soil-pipes or other large pipes require large spaces, 3-inch blocks, set the requisite distance away from the structural walls, should be employed.

The cost of furring is about three-quarters that of the partition and plastering.

WINDOW FRAMES

The windows are of such a great importance for ventilating that they must receive special consideration. The standard window in the market is the one having two sliding sash, technically known as the double-hung check-rail sash with

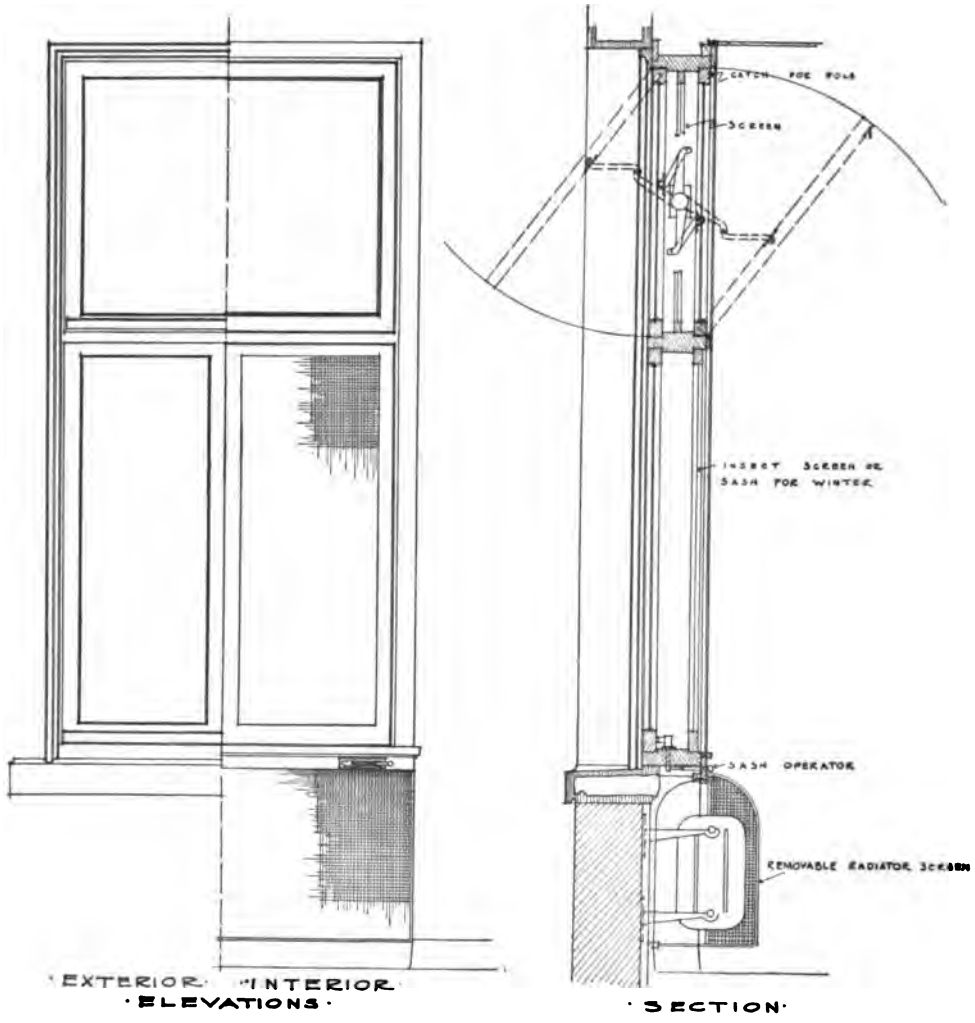


Fig. 22.—Window details.

box frame. This kind of window has the advantage of accessibility for cleaning, and where a safety rope is used the cleaner can stand on the outside of the window sill and wash the window while it is closed, but the window has several disad-

vantages. One is that it does not open the entire opening of the window, but only half in hot weather, and in cold weather it permits direct drafts.

The so-called plank frame window, with hinged or casement sash swinging inward, is also objectionable on account of the direct drafts and the difficulty of applying an adjuster by which the sash can be set and held at any angle. These objections also apply against the same kind of a frame with sash swinging outward, but such sash can be equipped with satisfactory operators, can be opened and closed without removing the insect screens, which must be on the inside when the sash swings outward. Double transom sash in the upper part of a window will ventilate a room

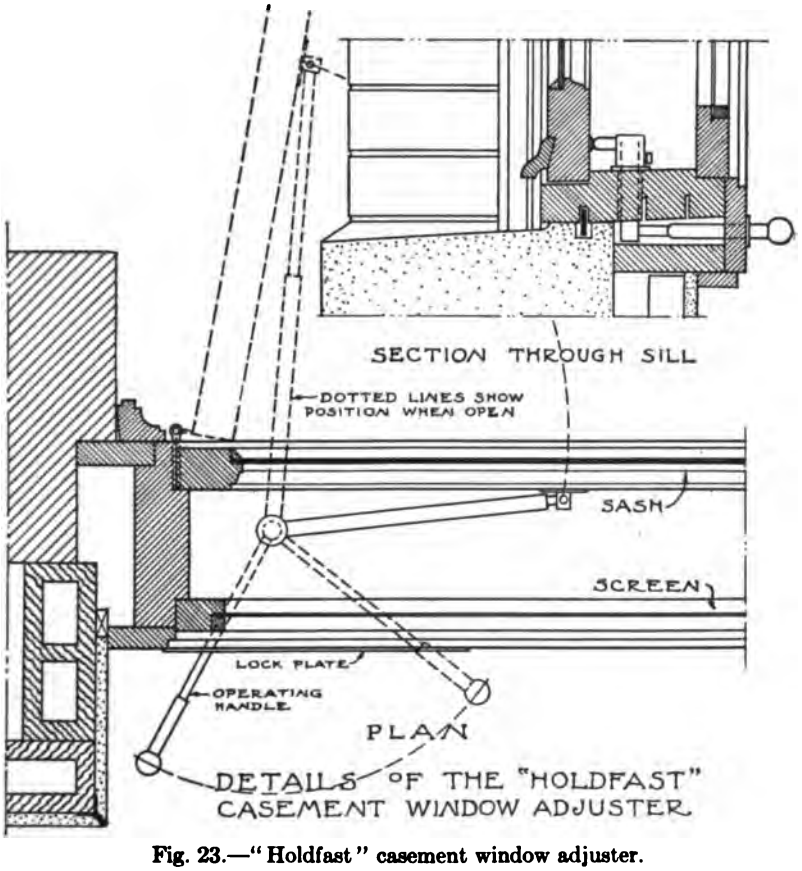


Fig. 23.—"Holdfast" casement window adjuster.

rapidly without objectionable drafts. Such transoms can be used in combination with double-hung sash for the lower part of the window, but this is not advisable, except where the window frames and the stories are unusually high. Where they are to be used in frames and stories of ordinary height the lower portion of the window should be equipped with outward-swinging casement sash (Fig. 22), operated by casement adjusters, such as the Casement Hardware Co.'s "Holdfast" (Fig. 23), or the Yale and Towne Mfg. Co.'s Wilkins' "Operator" (Fig. 24).

The inside of the frame should be rebated for hinged screens for summer use and inwardly swinging casement sash for winter use. With such windows the entire window opening can be used in summer time.

The outer transom should be hung on its upper edge and swing outward from the bottom. The inner one should be hinged at the bottom and swing inward from the top, and the two connected by a friction center device, which can be obtained from several makers of hardware, and which will not interfere with the placing of an insect-screen in the middle of the space between the two transoms. The connecting device will open and close the outer sash when the inner one is similarly operated. The outer sash, fitting like an awning, will protect the open window from rain, and can be left open unless the rain-storm is accompanied by a very strong wind. The inner transom will deflect air currents upward, so that the fresh air

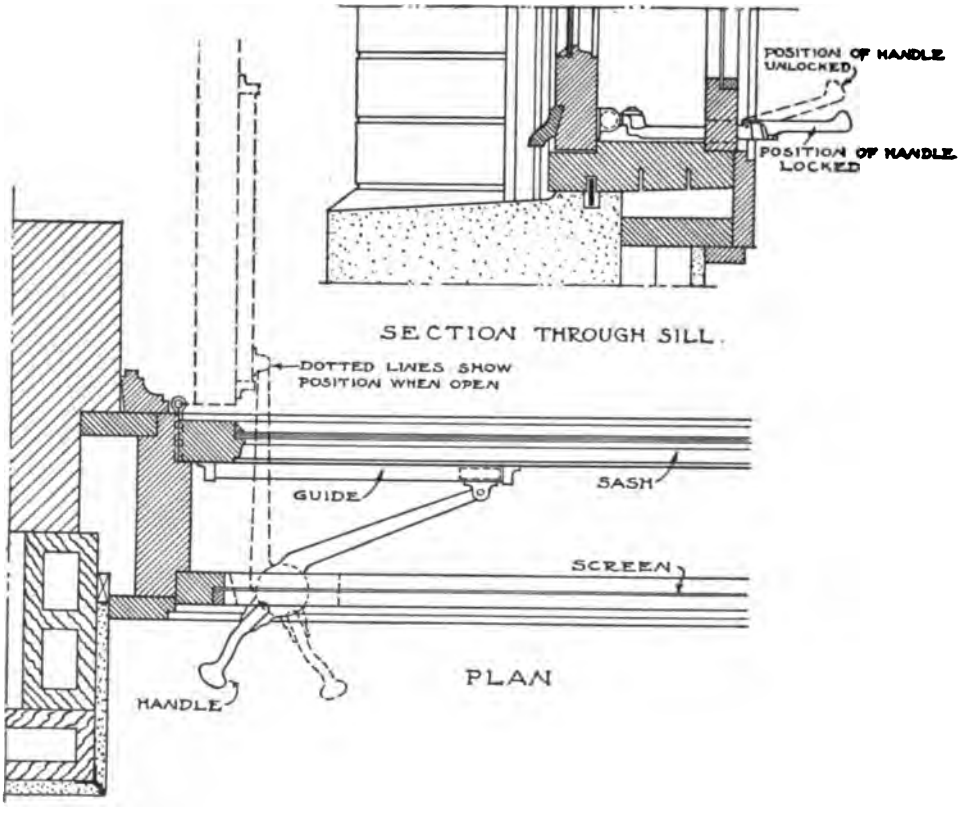


Fig. 24.—Details of the "Wilkins" casement window adjuster.

will be diffused and not enter in drafty currents. The frame and sash are illustrated in Figs. 22–24.

To obtain a weather-proof joint between the edges of pairs of hinged sash where they meet, the architect must resort to peculiar detailing of the woodwork, which permits the opening of either the right- or left-hand sash in advance of the other, whichever way it may be detailed; this can be avoided by placing a vertical fixed piece of wood, termed a "mullion," between the two sash.

WOODWORK

Dense, close-grained, hard woods are the most desirable for hospital purposes. The coarse-grained woods, such as oak, ash, and mahogany, must be filled with a mineral filler to obtain a smooth surface before they are otherwise treated.

Birch is the lowest priced hard wood on the market when accepted without selection. This is not suitable for light or natural finish on account of variations in coloring. The greater portion has an even, pleasing color, but there are enough pieces of white sap or a dark-blue sap to destroy the harmony, and it is consequently necessary to stain such wood, when it at once becomes darker than is generally accepted as suitable for a hospital, and it becomes necessary, therefore, to specify a selected birch, which costs a little more. This, when finished natural, is very satisfactory. Gum wood is rather too dark for hospital use, is of comparatively soft texture, but may be considered in some instances. Yellow pine is hard, dense, and one of the best of the cheap woods; it darkens, however, with age to an extent and to a tone not generally pleasing. It can be stained in any variety of stains except the lighter ones, so that, whereas it may be usable in the service portions of the hospital, it is hardly suitable for the wards and the rooms used by patients.

Mahogany may be used, but, on account of its expense, only in a few special private rooms; but even in these genuine white enamel work on birch would be more attractive to the average patient.

White enamel work, having the appearance of the favorite egg-shell surface, can be produced by the brush without rubbing if one of the higher grades of enamel is used, and this effect can be obtained by a comparatively small number of coats; in some instances as low as three. Inasmuch as the wood used should be hard enough to resist some wear and abrasion, the cheapest kind of birch may be used, and with three or four coats of good enamel paint such woodwork does not cost any more than a good oak or ash.

In order to avoid recesses and other places which are cleaned only by the expenditure of considerable labor, it has been the fashion for the past fifteen years to use only flush doors, that is, doors without panels, in the latest hospital construction, but these doors are so severe in appearance that they have a gloomy effect on patients, so that some of the newer hospitals have reverted to the use of single-panel doors; it is not necessary to do this, however, for the flush doors are veneered on built-up soft wood cores, and with veneering it is a simple matter to inlay a border line or lines marking imaginary panels. These border lines can be made up of narrow strips of dark or black wood, so that the heavy, severe effect is removed at once. This is done by a number of manufacturers and at a comparatively small expense above the cost of a flush door.

Those who have complained of the severity of the flush panel doors object to the omission of woodwork; in their opinion the depressing effect of the cell-like severity is much greater than the possible deleterious effect of the few additional angles introduced by trimming the door and window openings with wooden facings. The wooden casings should be molded sensibly and with not too many quirks and angles.

Many attempts have been made to avoid the use of projecting wooden door and window casings, but this has not been successful for several reasons, viz.:

The frames cannot be set after the plastering is completed, except by the use of temporary frames or other woodwork to furnish a guide for the plasterer.

After the temporary woodwork has been removed and the permanent frame set the joint between the wood and plastering must be filled or pointed, but the twisting or shrinking of the wood or the slamming of doors break the putty joint, and it is then even more unsightly and unsanitary than the angle between the plastering and wooden casings which it is endeavored to avoid.

Steel Frames and Casings.—Plastering is attended with the use of so much water that it is not practicable to set finished door frames prior to the plastering,

consequently it is necessary to make flush frames of a material not effected by water. Drawn steel, combined frames and casings, appear to be the first successful casings of this kind. They are slightly molded, but without sharp angles. The edge adjoining the plastering is raised slightly, so that if the joint between steel and plaster is opened by the slamming of doors it will not be so noticeable as it would if both surfaces were wide and flush.

The cost of metal doors and furniture has been greatly reduced very recently, and it is possible that simple metal trims, fitting the plaster closely and coving away from its surface, will soon be on the market. If this is realized, the objection to casings will fall away, for there will be no internal angles, and the coved and rounded surfaces can be cleaned by one movement of the moistened cloth.

The hospital architects of Germany have recognized the severe appearance of hospital wards on account of the omission of woodwork, and have overcome this successfully by designing simple painted wall treatments, using lines and stencil dots or stencil ornaments designed in good taste, outlining the door and window openings, and possibly paneling the walls by the application of painted lines. Such work, in the hands of the ordinary house-painter, would be worse than the severity of untrimmed openings, but in charge of a competent designer can be made pleasing and can be obtained at a low cost. It must not be forgotten, however, that metal door and window frames have the disadvantage of not yielding to repairs in the event of a door or window warping, as will sometimes happen.

PLASTERING AND WALL FINISHES

The cement wall plasters now on the market are preferable to lime and sand, on account of the more reliable mixing of the ingredients and on account of being harder after setting. For walls and living-rooms a lime, putty, finishing surface is usually hard enough, but the prepared wall surfaces, such as the U. S. Gypsum Co.'s Universal Finishing Material, is somewhat harder and denser. The same company's gray finishing material, if thoroughly troweled with a steel trowel, will result in a very hard, dense surface having a slight polish. Keene cement, used as a finishing surface, is very hard, smooth, and dense. The No. 40 finishing material or Keene cement should be used in toilet-rooms, bath-rooms, operating-rooms, dressing-rooms, serving pantries, kitchens, and wherever steam is used in sterilizers or steam tables. In cellar and basement rooms any kind of plaster mixed with lime should be avoided, and only Portland cement and sand should be used. Plasterers object to this, for it is difficult to apply and hard to work, inasmuch as it is not as fatty as lime mortar, and the average journeyman mechanic will insist on adding cement to lime mortar, but the result will not be efficient, for lime is hygroscopic and will dry out and absorb moisture alternately, showing efflorescence on the surface and saponifying the oil in paints.

INTERIOR PAINTING

The modern high-grade enamel paints, made of Damar varnish and pulverized quartz or spar, are best suited for hospital work, and should unquestionably be used throughout the operating departments, dressing-rooms, bath-rooms, toilet-rooms, excreta closets, and wherever steam or water is used considerably, and, if the means will permit, such material should be used throughout the hospital. Where this expense cannot be met the walls should be sized with oil size, and painted with not less than three coats of white lead and linseed oil. Enamel

paint and oil paints can be tinted to any desirable shade, and it is quite obvious that the lighter shades should be used, but, inasmuch as this largely is a matter of individual taste, a recommendation by the author will serve no purpose.

DETAILS OF EQUIPMENT AND MECHANICAL ARRANGEMENT

Screens

Insect screens are now made by so many specialists in this class of work that they should not be purchased of the ordinary mill or carpenter, for the screen makers have machinery for producing stronger joints than the ordinary halving or tenon and mortise, also for special rebates and interlocking mouldings to secure the wire mesh and facilitate its replacing.

There are also several manufacturers of metal-frame screens. In the first of these to be marketed the wire mesh could not be replaced except at the factory, but this is not now the case with some of them.

A durable wire mesh is important; bronze wire is the best; tinned wire, also termed "pearl wire," and galvanized japanned wire are named in the order of their durability. Inasmuch as the life of metal frames is probably longer than that of wooden frames only bronze wire should be used with such frames.

Screens should be the full size of the window opening, so that windows having double-hung sash may be opened at both the top and the bottom.

Sliding screens equipped with springs to hold them at any position, either at the top or bottom of a window, can be obtained, but these do not permit the opening of both the top and bottom, and are not convenient for moving to different positions by the nurses when the windows are large.

Miscellaneous

Weather Strips.—There are many kinds of metal weather strips on the market which should not be confounded with the old-fashioned wood and rubber strips, which soon lost their efficiency by the hardening of the rubber. The cost of these is not high, and they undoubtedly make for comfort, and also for economy in the consumption of fuel, and reduce the amount of necessary cleaning. Such strips do not cost over 8 cents per lineal foot, so that the stripping on a window of average size costs about $2.50.

Hardware.—The variety of hardware now manufactured is so large that it is not necessary to describe all. The points of greatest importance for hospitals are simplicity and durability. A ward is seldom locked, but the knob latch is in constant use. This should, therefore, be well made, of generous size, with good springs and an additional "easy spring." Smooth glass or porcelain knobs should be used, for these can be cleaned easily and reveal the presence of dirt and dust.

Doors to offices and supply rooms which must be frequently locked and unlocked should have cylinder locks; entrance doors, sink-rooms, pantries, and doors to many other rooms should have door checks and springs to make them work noiselessly and automatically. Practically all doors should have door checks to prevent their slamming, but, inasmuch as the cost of the only satisfactory checks is about $3.50 and upward, this safeguard against noise is usually omitted.

Many inexpensive devices, such as rubber stops, have been tried, but usually fail on account of lack of adjustment. A small cylinder secured to the head of the door and a plunger on the door itself may be obtained at a reasonable price, but

the door can only be closed slowly when one of these is attached and the doors are frequently left open when they should be closed.

Glass, porcelain, and enameled iron push and kick plates are easily broken, and, therefore, plain or nickeled brass is generally used.

Blanket Warmer.—A blanket warmer, such as illustrated on page 159, for an operating department will be sufficiently insulated if the floors, partitions, and covers are of ordinary hollow clay tile or gypsum block plastered on both sides. The doors and door frames should be of iron neatly fitted together, and the floor should have a guide track to guide the carrier, which is the same as a standard clothing carrier of a laundry dryer. The dryer recess should not exceed 7 or 8 feet in height, and should have a flue to draw off moist air. Any of the laundry-dryer makers can make a truck for carrying the blankets, which will operate satisfactorily.

Any good metal door and frame, about 2 feet wide and 7 feet high, as obtainable in the open market can be used. The heating coil can be the usual pipe coil. The blanket warmer can be built by local mechanics if laundry-dryer makers are out of reach.

The coil should be connected to the line of steam piping, which supplies the steam tables and sterilizers with steam under 30 to 60 pounds pressure, because the heating apparatus of the building may not be in operation in mild weather.

An electric light on the ceiling of the warmer, with an indicating switch on the wall outside of the door, is a convenience.

PERMANENT INSTALLATION

BOILER AND POWER SUPPLY

The steam supply for hospitals includes primarily that necessary for the heating system, for sterilizing, cooking purposes, water heating, for laundry equipment requirements, and for the elevators and other motors, such as the fans. As all of these uses, except the heating, need steam of high temperature (and consequent high pressure), the use of the low-pressure cast-iron type of boilers, as commonly installed for heating plants, is here precluded, unless a small high-pressure auxiliary boiler, such as a vertical boiler, is installed solely for this purpose with no connection to the heating apparatus. This requires two fires in winter, but has the advantage of requiring only a small fire in summer.

The high-pressure type of steel boiler in some of its usual forms is, accordingly, almost universally installed. In small institutions the fire-box brick enclosed type is often used. This type has heat passages around outside of the shell and between it and the enclosing brick work, thus utilizing the outer shell as added heating surface. Marine type boilers are also used in somewhat larger sizes. They are self-contained, installed without brick work, and are of high efficiency. Their somewhat higher first cost is an offsetting feature which may decide against their use. The most commonly used boilers, however, are the horizontal cylindric shell, return flue boilers, set in brick work, with furnaces and grates designed either within the brick work of the setting or as "Dutch ovens" in front, as determined by size, capacity, coal available, space limitations, and the like.

The first two types of boiler have their furnace spaces enclosed within the steel water-containing portions of the boiler, and are generally found objectionable on account of their smoke production. It is practically impossible with many

kinds of coal to so fire them throughout the range of their capacity and under the usual operative conditions that smokeless combustion will result.

The more important cities are recognizing this, and many restrict their use to the smaller sizes and under very moderate operative requirements.

The return flue boilers in brick settings may, on the other hand, have their furnaces properly designed to suit practically any of the commercial grades and kinds of fuel, and this type of boiler is to be recommended for use up to the limiting size and capacity. They are ordinarily built in commercial sizes up to 150 H. P., and are to be considered when the plant does not require more than, say, three of this size. To these should be added one spare boiler beyond the maximum requirements of the entire hospital service load, for so imperative are the needs for steam in a hospital that a reserve boiler should always be available in case of accident, and principally for use during the necessary shut down of any one of the other units for cleaning.

Where the power or steam requirements are greater than above, the water tube boiler in some of the standard high-grade types should be used. These are ordinarily built in sizes ranging upward from 175 to 200 H. P. Water tube boilers have a considerable advantage over any of the other types in respect to safety, cost of maintenance, and length of life. They are so constructed that failure or deterioration of one part, such as a tube, necessitates only the renewal of that part, and leaks or other failures commonly develop in these boilers only as minor defects, readily remedied.

Automatic stokers of a type suitable to the coal and the operating conditions should replace hand-firing in the case of larger units and in smaller institutions whenever, by their use, labor can be saved. This is usually the case when more than three or four boilers compose the installation.

In all power plants coal-storage space must be considered, and in the larger ones the use of coal bunkers or overhead tanks or bins are advantageous, especially where automatic stokers are employed.

Coal conveyors and elevators and apparatus for ash handling are also items to be provided for in the larger boiler plants. The boiler-room location should receive early consideration and a liberal space be provided. Any handicap in this department is a continued tax upon the hospital operating cost.

The introduction of engines and electric generating units is a problem that hinges upon the cost of electric current as obtainable from outside sources, such as city or public electric-supply companies.

The local labor costs are another important item, and in case of hospitals, say, with 100 beds or larger, the solution most frequently is found to be that a private power plant can furnish steam and electricity for light and power more economically than would result from the purchase of electric current from outside concerns.

It must be borne in mind that steam must be furnished to the hospital at all times, and that throughout a large portion of the year the steam requirements for heating may be in excess of that for power, so that live steam must be used in addition to the exhaust steam from engines. Only a fraction of the heat in the steam entering the engine cylinders can be extracted for power production and the remainder is available for heating purposes. The supply of the exhaust steam is often adequate for heating purposes, except during extremely cold weather.

It should be borne in mind that the illuminating service and heating service are not simultaneous during each twenty-four hours. The demand for heat is greatest during the morning hours; much the greater part of electric lighting is crowded into the late afternoon and evening. This lack of coincidence is an obstacle

to the economic application of steam to heating and the production of electric energy.

The added cost, then, for electric current throughout the heating season is a very small item, consisting of some added labor and some investment charges to cover the generating units; thus the average yearly power, light, and steam bills are, on this account, lowered considerably.

In the case of all hospitals, however, this important question should be carefully considered well in advance of the planning, and, like all of the engineering equipment problems, of which this is probably the most important in a financial sense, it should be answered only after it has received study and has been estimated in detail and reported on by some experienced engineering authority.

Frequently the question arises, will it not be expedient to buy light and power from a commercial company? This question cannot be settled alone in dollars and cents. It must be borne in mind that the hospital needs not only light and power for the motors, but exhaust steam for heating, boiler heat for sterilizing its considerable quantities of water necessary in all modern institutions where asepsis is practised, such as the wash and dressing waters in the operating department, and the high-pressure steam for sterilizing and for cooking vegetables and the like and making the coffee and tea. High-pressure steam can be carried over very short distances, if it is to be efficient, and the drop in efficiency of exhaust steam is so great in the pipes that the losses in going a considerable distance render the practice prohibitive. Pipes well covered and carried through tunnels where a dry and warm temperature can be maintained will deliver efficient steam at a commercial price 300 or 400 feet, but beyond this the losses are so great that an institution should attack such a proposal very reluctantly.

Then, again, a hospital must have its service at *unusual hours* that cannot be controlled, and a commercial plant will find it extremely expensive to deliver high-pressure steam even a short distance at midnight, or even to be always ready to do so.

Another question concerns the engineering staff. There is always plumbing to be repaired or altered, radiators and regulators to be fixed, and work for an electrician to be done. The hiring of this work in small jobs and in frequent visits of those mechanics is extremely expensive, while one's own engineering force can do it all as a part of the day's work. There are also innumerable odd jobs that good plumbers, steamfitters, and electricians can do not strictly within those trades if a small shop is available, such as mending kitchen utensils and machinery, the various sterilizers, and a great part of the operating apparatus, such as metal beds, tables, wheel chairs, and so on. Many of these men, too, are most ingenious and initiative—they can make splints, mend clocks, construct artificial supports, bedrests of special pattern, and help the doctors in the design and construction of special apparatus, and so on almost *ad infinitum*. All these things cost too much money to warrant liberality in respect to them, and yet, if they can be done with a force working for wages at other work, there will be a constant stimulus for the doctors to do new things and *thus* progress.

So there are many questions to be answered before a hospital management can decide whether or not to build and operate a power plant.

General Service Steam Piping.—Besides the steam required by the heating system and the laundry there are many uses for steam throughout the hospital, and to supply these, in general, a steam service system of piping should be brought from the boiler-room and extended throughout the hospital to the various locations where this service is required.

Among the various steam-using utilities will be kitchen equipment, including dish washers, steam tables, hot plates, coffee urns, steam food boilers, jacketed cooking kettles, bakers' proving closets, and pastry kettles.

In the diet kitchens, steam tables, dish heaters, hot plates, the autoclave, steam tables, and the like require steam. The service rooms throughout the building will need steam tables, dish sterilizers, and utility sterilizers.

Utility rooms will have similar steam requirements.

Surgical dressing-rooms will need steam for instrument sterilizers and water sterilizing apparatus.

The blanket warmers should also receive steam from these service lines.

The service piping system, in general, should be designed along the usual lines of high-pressure steam piping service. It may have to carry a working pressure of between 50 and 80 pounds, and it should be tested to at least 120 pounds. This necessitates high-grade heavy valves and fittings and good workmanship throughout.

In general, the piping system should extend as directly as possible to the various locations where used, and should be exposed and accessible for inspection wherever possible.

The lay-out requirements will include a main from the boiler-room, this branching to risers throughout the building, and these, in turn, having small branches running directly to the fixture locations. From the fixtures return branches are carried to return risers and these assembled in a return main, extending back to the boiler-room, where, properly trapped, it discharges the condensed steam into a hot-water collecting tank, or to a boiler feed water heater. Valves should be provided at all fixtures.

As the above description would indicate, it is essential that all of the various steam-using items of equipment be selected early and their location within the hospital then determined, so that the most direct and economic method of piping and equipment can be determined in the planning of the building.

The detailed designing of this pipe work needs expert consideration, and it will ordinarily be designed, purchased, and installed as a part of the heating power and other piping work.

HEATING

The comfort of patients, and the carrying on of the various activities of a hospital, depend so largely, throughout a considerable portion of the year, upon the proper heating of the rooms that the hospital heating system must necessarily be most complete and effective.

The requirements of the several hospital departments are so specialized that a detailed design should be executed by experts especially experienced in hospital engineering.

Among the requirements for a satisfactory hospital-heating system must be considered cleanliness and ease of maintaining cleanliness, noiselessness at all times, prompt and ready regulation, and this, preferably, through a considerable range of temperature, freedom from leakage, odors, or deleterious effects upon the air of the rooms, with simplicity of operation and substantial design throughout.

The special air-supply requirements of various classes of rooms project the influence of ventilation upon the heating requirements, and the design of the ventilating and heating equipments should go hand in hand and should receive equal consideration.

As to the various types of heating apparatus, stoves and hot-air furnaces have proved inadequate and unsuitable to high-grade or exacting requirements, and are now seldom considered in hospitals of any permanency or importance.

Hot-water heating systems are easily managed and hold a uniform heat for some considerable length of time without attention, and they are accordingly serviceable in smaller institutions.

Where the matter of attendance at night is an important factor the slow cooling of the system is an advantage, although this is offset largely by the fact that it responds with equal slowness to a demand for more heat. This system is at a disadvantage, in that it requires quite a considerable increase in the size of the piping and all of the radiators over that required by steam heat, hence it is also more expensive to install.

Steam heat is more extensively used in hospital practice. Of the several steam-heating systems the simplest is the plain or gravity system. The single-pipe method of piping is, in general, the least expensive, and may advisedly be adopted in smaller institutions, where the distances of pipe runs are short, and accordingly permit satisfactory uniformity of operation throughout the building.

With this system there is the objectionable feature of air valves on radiators, which allow the escape to the rooms of objectionable air from the radiators whenever steam is turned on.

An auxiliary air discharge line system, connecting all the air valves to an outlet in the boiler-room, though an added expense, is desirable in any installation of this type.

Larger buildings require a more effective piping system and added devices to insure proper uniformity of heating throughout their extent. Steam-heating systems in these cases should have the two-pipe system for supplying steam and returning the condensed steam from radiators to the boilers.

The so-called vacuum systems of steam heating include specially designed vacuum valves or traps between the radiators and the return piping and a vacuum pump in the machinery room operated to draw a vacuum in the return piping system, thus inducing prompt removal of air and more rapid and complete filling of the radiators with steam. In consequence, the operation of the heating system at a lower steam pressure is possible with these systems.

Vacuum systems are of special value where the heating system takes steam from the power plant, utilizing engine exhaust. As the steam can be delivered to the heating system at practically atmospheric pressure a resultant saving in the capacity and economy of the engines thus obtains.

A recent development of temperature-control valves for radiators deserves especial attention in connection with hospital installations. These are designated by the various makers by different trade names, such as vapor systems, modulating systems, vacuo-vapor, thermograde systems, and the like.

They are substantially similar in principle, and furnish essentially some type of hand-control lever valve on the radiators with indicating disks marked in fractional parts and designed for setting at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or the full capacity of the radiator. These systems need a proper and ample piping system, efficient regulating valves on the main steam-supply, so operating that they assure a positively uniform steam-pressure at all radiators and with a return piping system carrying back the condensed steam and any entrained air. These systems operate most effectively to permit the use, at will, of either the entire radiator or approximately such fractional parts of it as is desired by simply turning the valve to the desired indicated position.

The systems give by far the best control of radiators that has yet appeared and their use will result in a very considerable saving of coal-supply. Manufacturers claim and will guarantee a saving of between 15 and 25 per cent. of the season's coal bill. This is largely due to the fact that, with the usual systems, the temperature control in rooms almost universally is attempted by closing and opening windows, with the resultant loss of heat from the building.

These systems require radiators of the hot-water type, but intermediate in size between those required for steam heating and for hot water. The cost of these installations is, in the larger buildings, somewhat less than that of hot-water heating systems.

Large institutions, especially those including a number of buildings separated over some considerable area, will ordinarily have their own power and electric generating plants. These may well consider the installation of a system of forced circulation of hot water, which, while equipped in the various buildings and rooms, practically the same as in the ordinary hot-water heating system, has a circulating pump connected to the main supply pipe in the power plant or supply point, so that the water is circulated rapidly, positively, and uniformly throughout the whole institution.

One advantage of a forced circulation of hot water is that the water can be circulated at a positive uniform speed under all conditions, while the temperature of the water can be varied to suit the varying demands for heat in accord with the outdoor temperature changes. The temperature of the whole institution is then readily regulated in the engine-room as the variation of the temperature of the hot-water supply can be controlled by a single steam valve. The control of temperature in the rooms is readily regulated by adjusting the individual radiator valves.

Inasmuch as the varying hot-water temperature demands are best made by varying the steam-supply temperatures, the main advantage of this type of heating systems is that it permits the power-plant engines to be run much more economically as condensing engines, exhausting their steam under a varying vacuum (and thus at a corresponding variation of temperature), which will follow the heating requirements very closely. This utilization of the low-temperature steam will permit, through the use of condensing engines, a probable saving of coal costs over non-condensing engines of between 15 and 25 per cent. throughout the heating season.

The cost of this system should not be much in excess of that of the usual hot-water heating system. The added cost, however, is more than offset by the gain in economy of operation.

Referring to details of construction, the item of radiators in hospitals is important, regardless of the system selected. Those of the simplest and plainest design should be the only ones chosen, as the so-called ornamentation serves to collect dirt and increases the cost of keeping them clean, or results in their always being foul. The type of ornamentation is, moreover, frequently obtrusively ugly.

The proper location of radiators should always receive study, and the services of an experienced designer is here required.

Extra high legs on radiators are most advantageous, as they permit the more rapid cleaning of the floor. Better still is the use of legless radiators, supported free from the floor by bracketed attachments to the side walls. These are largely contemplated now in the better class of hospital designs.

The use of radiators, having especially large and free spaces between the cast-iron sections, is most advantageous for facilitating ready cleaning, and, although

such radiators occupy more space and are slightly higher in cost, their use in hospitals is recommended. In operating- and similar rooms they should always be insisted upon.

The desire to keep operating-rooms as free as possible from all apparatus, fittings, and other items other than surgical apparatus has resulted in a number of special methods of heating such rooms. Notably among these have been some operating-rooms recently constructed, with their interior walls made up almost entirely of opalescent glass, and between these inner walls and the partition walls steam coils and radiators have been installed, so that the entire wall surface of the rooms is so heated as to keep the room at the required temperature. This system needs especial attention in design to preclude the necessity for attention or repairs and some extra building space has to be provided for it; but the operation is so entirely satisfactory that the added expense is more than justified.

In the halls, corridors, lecture rooms, and general public sections of hospital buildings, where uniformity of temperature is more desirable, the added expense of a system of thermostatic control for radiators is usually justifiable in connection with the heating system. These consist, in general, of a system of thermostats mounted on the room walls, and so connected electrically or by an air-pressure piping system to specially designed radiator valves that a change of two or three degrees in the temperature of the room will cause them to automatically regulate the radiator valves to hold the temperature constant.

The details of heating system, piping, valves, and equipment, including the method of running piping and the like, should, of course, be left in the hands of experienced engineers, with whom the architects will co-operate to provide space and facilities. It should be stated, however, that in no other service is excellence of design or high quality of equipment so essential as in hospital work, as the operating requirements are most exacting and low cost for attention and repairs is most desirable.

While it is, in general, advisable throughout the hospital construction to keep all rooms as free as possible from fixtures, apparatus, and fittings not actually necessary, the question of whether the heating-system pipes, such as risers and returns, should be left exposed or hidden in the walls is one of the problems of hospital architecture. Concealed piping is difficult to reach, and occasionally a leak will appear that may mean a break anywhere within several floors, and a great amount of wall may have to be torn out. But modern plumbing, with cast pipe and threaded joints, has made such forward strides that such leaks are very rare, especially in concrete construction.

On the other hand exposed piping is hideous to look at, intolerable in the rooms and wards of a hospital, impossible to keep clean, and necessitates loose connections at the ceiling openings, which may easily be the avenues by which infections may be spread upward or downward. Assuming good construction in both cases, the cost and upkeep will be pretty nearly the same.

PIPE COVERING

Discretion in selecting piping covering or insulation for the various piping systems will result in considerable saving of cost of installation, combined with the most economical operative and maintenance expenditures. The highest grade of insulation for high-pressure steam and refrigerating piping is essential. Cold-water pipes need insulation only to prevent condensation of moisture upon them.

Hot-water piping should have a good grade of insulation. Steam-heating system piping, where passing through heated rooms, needs, in general, only enough insulation to protect the room occupants in case of accidental contact, but if these are embedded in outer walls they should have high-grade insulation. As with other details of the engineering equipment, trained technical advice is advisable in making an economic selection of insulation.

LIGHTING

Beside the usual problems of efficient interior building lighting called for by offices, assembly rooms, corridors, halls, and service rooms, a hospital presents many problems peculiar to its own class of service.

Most modern hospitals are so located that electric current is available either from outside sources or from local power plants, and, on account of its decided advantages over other systems, electricity has practically superseded all other forms of illumination in hospitals. Throughout the service rooms and those given over to the use of the public, the illumination is governed to a certain extent by the architectural treatment, but more usually by the location of furniture and fixtures.

The tendency in modern practice is to provide the best possible light distribution without overintensity. Standard fixtures are available in a variety of types, which allows of ready selection to suit any condition or requirement.

Patients' rooms, and wards in general, require a soft, subdued light, and the so-called indirect systems are gaining in favor. These systems use inverted lighting fixtures, which throw the light directly to the ceiling, whence by reflection it is diffused throughout the room. Either with this system in use, or with the use of ordinary ceiling fixtures, side-wall bracket lights are essential for use when doctors or nurses are working about the patients.

Wall plug outlets for attachment of cords, with portable lamps for doctors' use, are of great assistance, and are commonly included in the equipment. These outlets are also available for use with the many serviceable electric specialties now on the market. Foremost among these are electric-warming pads, which seek to displace the usual hot-water bottles.

There still exists unfilled a demand for a practical adjustable wall-bracket light shade which will permit, at will, a variation of intensity or direction of light; in consequence, unsightly temporary shades, constructed impromptu from newspapers, magazine backs, and the like are seen frequently in use.

A desirable fixture arrangement, especially in rooms used by convalescent patients, is a pendant switch on a cord, arranged to be available at the patient's hand, and by which the bracket light above the bed can be turned on or off at will. This makes a very complete and convenient fixture when a wall switch for nurses' use is included at the bracket.

The lighting of operating-rooms is, no doubt, the most difficult of hospital-lighting problems, and many methods are in use and many more have been experimented with. Obviously the light should correspond in direction, source, intensity, and color as nearly as possible to daylight illumination entering through the large north windows. Figure 25 shows a combination of daylight and night illumination.

Modern incandescent lamp filaments are more and more nearly approaching daylight color. The location of light source has many practical limitations. Fixtures extending into the room continually gather dust, and, when lighted and

thus heated, they induce air currents which tend to circulate the dust around the room. Groups of lights in fixtures hung from the ceiling are, on these accounts, more or less of a menace and are difficult to keep clean. The cleaning may be facilitated by having the fixtures made adjustable and counterbalanced. Portable banks of lights fitted upon stands with heavy iron bases have been much used, but lamp cords are then under foot and the fixtures usually in the way.

Groups of lights under a large reflector on swinging brackets (Fig. 28) are also in use. These do away with some of the objections to floor-stand fixtures, but are open to the same objections as to dust collection as are ceiling fixtures. It is rather difficult to so locate this type of fixture as to avoid objectionable shadows. Large groups of lamps placed close to the operating table are also objectionable, on account of the heat which they generate.

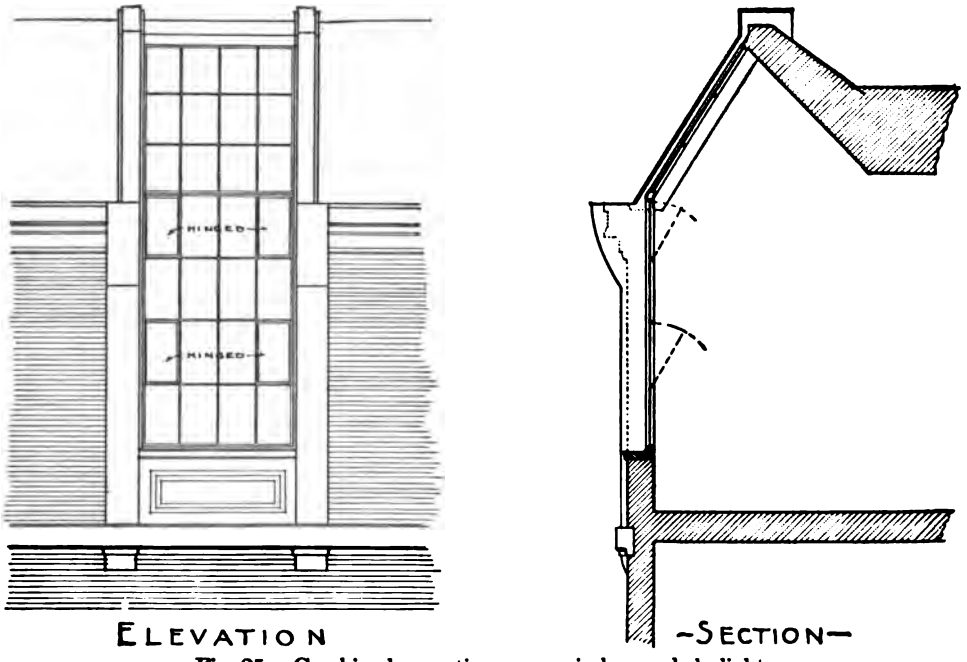


Fig. 25.—Combined operating-room window and skylight.

Some operating-rooms, especially abroad, have had installed systems of strong arc lights equipped with lenses and reflectors, and placed outside of the operating-room walls at such locations as to direct and concentrate their rays about the operating table. These are rather expensive systems, but if the lamps are well placed are effectual, though surgeons using them complain of the heat they generate and also of the intensity; at the same time the limited area of the light focus.

A very effective method of illumination in operating-rooms, which has been recently installed in some hospitals, makes fixtures or lighting devices within the room unnecessary. (See Figs. 26, 27.) It is made up, in general, as a continuous box or trough installed in the side walls and ceiling of the room and encircling the north light window frame. This trough is provided with a glass front set tightly in a frame work flush with the plaster. It is found that an ample number of lights can be installed in this fixture to give proper intensity of illumination, and the glass being made prismatic or ribbed good diffusion results.

A recently developed form of incandescent light, shaped as a straight tube about a foot long and supplied with a straight filament, can be so placed in these troughs as to make the light source a continuous line in the troughs and thus give perfect uniformity of illumination.

The above type of lighting fixtures, forming as it does a part of the wall surface, is tight and free from dust circulation and as readily kept clean as are the walls themselves.

The Moore light, a type of illumination now being developed, promises much in the way of a uniformly diffused light source of good quality. This light is made up within the rooms to be illuminated as a continuous glass tube, and consequently may be located wherever desired. The light source is a luminous vapor existing throughout the extent of the tube, this being controlled electrically and mechanic-

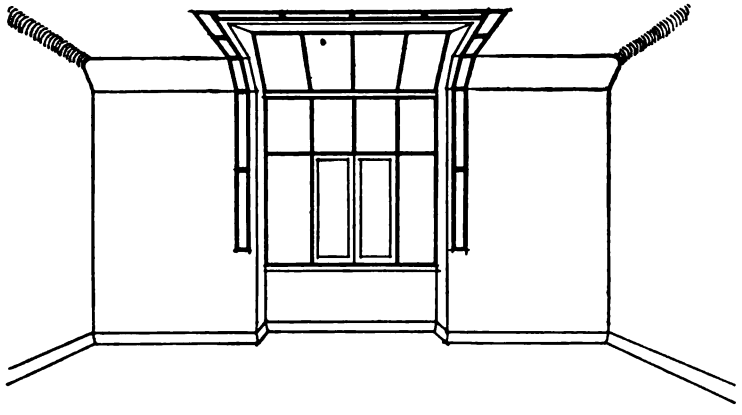


Fig. 26.—Interior view, operating-room windows showing linolite lighting around windows.

ally by the very ingeniously contrived automatic devices forming a part of the lamp. This lamp in the above form has not as yet been developed commercially to any extent, although the makers are now furnishing a small portable lamp unit, consisting of parallel illuminating tubes framed with a suitable reflector to form a lighting surface about 2 feet square. Some of these have recently been set up in hospital operating-rooms, and especially on account of the fact that the quality of the light furnished approximates sunlight very closely considerable success is claimed for them.

Lighting Fixtures.—Lighting fixtures should be selected for simplicity. The tubing and other metal of wall brackets should be heavy to withstand usage.

If the "indirect" types of fixtures are chosen, particular attention should be given to their reflecting surfaces, for some of them deteriorate so rapidly that the illumination suffers. Such fixtures require light-colored ceilings, preferably enamel paint, in order to reflect the light as much as possible.

In any case much light is absorbed by the reflectors and the ceilings, and, unless the most efficient lamps (with Tungsten filaments) are used, an excessive amount of current will be consumed to give the required illumination throughout the rooms.

There are two forms of light regulation for private wards and rooms that have recently become popular. One is called the "high low" and the other the "dim-

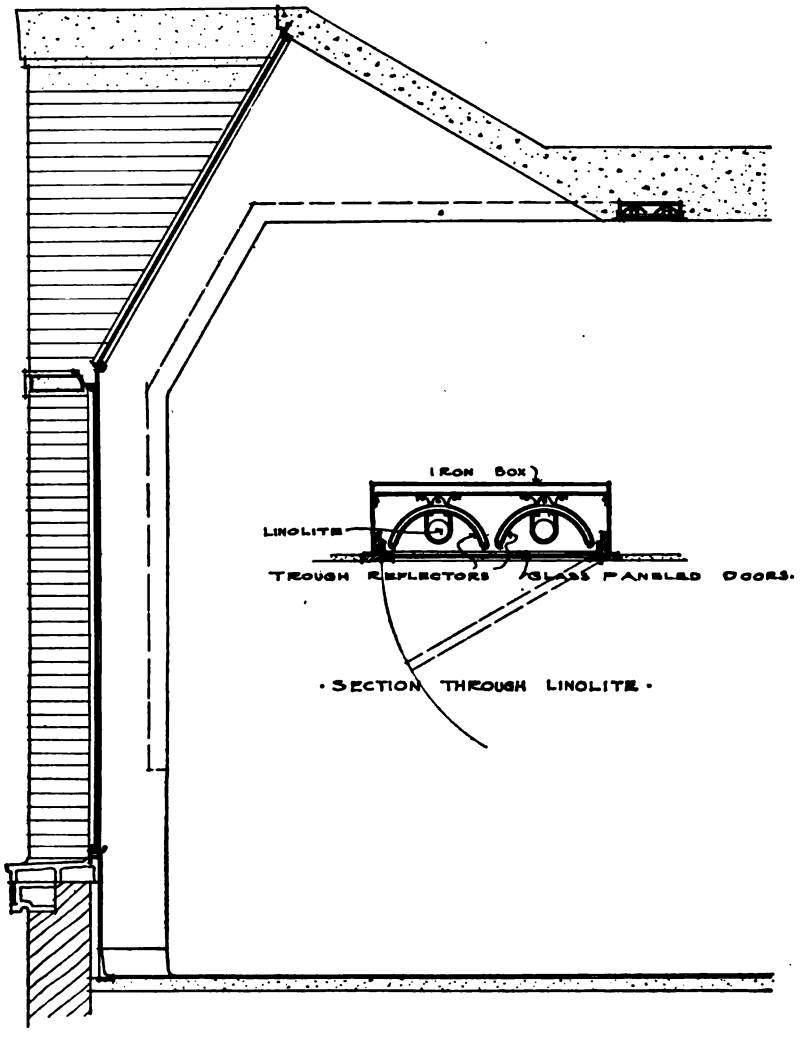


Fig. 27.—Section of operating-room windows showing linolite lighting around windows.

mer." In the former there is resistance in the lamp filament, and in the latter the resistance is in the socket. In both there is a tiny chain attachment that when manipulated turns the light up or down, just as an oil lamp may be turned up or down. The difference between the two forms is one of cost. The "dimmer"

socket costs about 75 cents, but is as permanent as any other socket. The "high low" lamp costs 25 cents, but the lamp is short-lived, perhaps one-quarter the life

Fig. 28.—An admirable lighting for operating-room.

of an ordinary lamp, and must then be renewed. One or other of these lamps is almost necessary in the hospital sick-room.

SIGNALLING SYSTEMS

Beside the usual public and private telephone systems with which modern hospitals are equipped, the special needs of hospital service call for reliable signalling systems for a number of purposes. An electric system of signals for calling nurses to the patient's bedside is now considered essential. The simplest and generally the least expensive type of these is the annunciator system. This is quite similar to those usually installed in hotels. An annunciator located at the nurses' desk or station in the corridor has drops or signal disks, numbered or lettered to designate the various rooms or patients' bed locations in wards. A pear-shaped push button attached to a flexible insulated wire or cord is furnished at each bed and wired electrically from the bedside location to the annunciator, where the patient's call is announced whenever the button is pushed.

To attract the attention of nurses from a distance an electric bell or buzzer is located at the annunciator, or an electric light is installed and so wired as to be lighted whenever a call is shown on the annunciator. Resetting the annunciator when answering the call extinguishes the light until another call is sent in.

A marked improvement is an extension of this system, accomplished by adding electric resetting circuits, so wired that to reset or cancel the call from the annun-

ciator the nurse must go to the room and push a button located at the bedside outlet from which the call originated. This guarantees that in every case the signal is responded to in person, and that if a signal is canceled from an annunciator this has been done by some one at the patient's bedside. The importance of this feature of the service is at once apparent. The only trouble is that in case the nurse fails to answer promptly the patient may undertake to call again by another push on the button, and so put out the annunciator light. To obviate this the shut-off light may be placed near the door, inside the patient's room, when the nurse can use it immediately on entering and so cancel the call, but where the patient cannot reach it.

A supervisory annunciator can be readily added to this system. This is a large annunciator, located at the superintendent's or other official's desk, and having signal drops duplicating those on the entire equipment of the signal annunciators throughout the hospital and working in unison with them. This places before the official continuously a visual record of unanswered calls, and should tend to very considerably increase the efficiency of this most important item of the nursing service.

More extensive elaborations of the above signalling systems have been developed. In place of the usual type of annunciators these have the signal cases containing electric lamps to indicate the calls instead of numbered drops or disks. These lights are visible and readily discernible at greater distances and tend toward bettering the service.

These signal cases may have a large or pilot light located above them or at any required location, and so wired as to be lighted and give indications that a signal is recorded or a call unanswered at the station. Lights placed above the doors of the patients' rooms or wards may be installed to serve as additional signals to safeguard each call and facilitate prompt attention. Electric resetting devices in the various rooms are similarly used with the various light signal systems.

The latest refinement in the matter of record keeping has recently been brought out in the form of a supervisory chart-drawing electric recorder. This has a continuously moving clock-driven record sheet upon which pens, operating in unison with their corresponding patient's call signal lights, leave a line measurable as minutes on the chart, and which indicates the exact time of calling and of answering every patient's call throughout the day. These charts can be taken each day from the recorder, and the bound sheets form a written record always available.

With increasing elaboration of the signal systems there increases, in general, the complication of construction. Care, judgment, and experience are essential in selecting the type best adapted to the hospital service requirements. The grade of construction and material should be of the best, thus insuring length of life and certainty of operation of the system.

Important to be kept in mind as essential is the selection of the most reliable and constant source of electric current, whether from dry, wet, or storage batteries, or by transformers or from the lighting current. In general, it is better if all the bell signalling and other service current can be supplied from one central source of energy. Current from the hospital lighting system, if perfectly adaptable, is preferable to storage batteries, and these, in turn, in cost of upkeep and uniformity of electric output are more serviceable than wet or dry batteries. Care must be taken that none of the lighting current can reach the patients' push cord, and, to avoid this possibility, it may be preferable to use storage cells that can be charged from the lighting circuit whenever necessary. In small installations the simplicity of dry batteries as a current source renders this type acceptable.

Among other details of the nurses' signal service bedside wall outlets should receive attention. These should be located so as not to be disturbed or injured when moving the beds. The cords at the bed should be heavy and of best quality. The pear push button should be smooth, readily cleaned, and as aseptic as possible.

Beside the doctors' call system, to be referred to later, other miscellaneous signalling service systems about the hospital include elevator call-bells, with pushes at each floor and annunciators in the cars; dumb-waiter calls, with pushes at each floor connected to an annunciator at the service floor, and with the gang of answering push buttons on the service floor connected each with a corresponding answering bell at the various floors.

A speaking tube at the dumb-waiter location is an added facility now usually considered essential.

DOCTORS' CALL SYSTEM

For the prompt and silent signalling of house physicians, staff physicians, and interns a very effective system is that of having banks of incandescent lights installed in prominent locations on the various floors of the hospital, as in corridors. These lights may be set either exposed in a vertical row on the side wall and be distinctively colored, or they may be boxed in by an appropriate fixture or case with ground glass sides, having numbers or letters corresponding to each lamp to designate the various persons to be called.

These lights are electrically connected with a set of push buttons grouped at a central point (usually at the telephone switchboard operator's desk), and in such a manner that, in the event a doctor is wanted, the pushing of his respective button puts in service his light signal in all of the corridors or signal locations throughout the hospital. He can at once get in communication with the telephone operator from the nearest telephone.

These systems are usually operated directly from the electric current of the house-lighting system, and are usually installed as a part of it and of a similar standard of construction.

SEWERAGE AND PLUMBING

Drain pipes, inside or under the basement floor, should be of iron to the connections with ordinary drains outside of the walls. The best material for outside drains is salt-glazed clay pipe. In localities where iron piping or labor to lay such is too expensive clay tile, surrounded in good cement concrete, is a good substitute for iron drains. For these a bed of concrete about 3 inches in thickness should be laid first, projecting about 3 inches each side of the drain, and the space each side filled with concrete to prevent irregular settlement and opening of joints.

Drains for chemical laboratories should be salt-glazed pipe.

The vertical, soil, and waste pipes should also be of iron. For these and the iron drains either extra heavy asphalted inside and outside cast-iron pipe and fittings with caulked and leaded joints must be used, or asphalted steel pipes, such as steam pipes with screw joints and special fittings threaded and recessed, so that the passage through the fittings will be smooth and have the same diameter as the pipes.

Where the city drains are too small to carry off the waste and roof water, or so located that water will back out of the fixtures on the lowest floor during storms, the drainage system should be divided into two parts, one part conducting the waste from the upper floors and roof to the city drains without an opening closer than 10

to 12 feet above the city drain, and the other part leading all waste into a sump equipped with an automatic ejector. These are operated by electricity, compressed air, or steam, and, if the waste consists only of water, a duplex equipment may be obtained for $500 or $600; but if the waste is also from closets, the lowest cost for a duplex equipment is about $1200, and from these prices upward, depending upon the amount of waste. The best known of these ejectors are the Priestman, Shone, and Yeomans, all of which are good.

The drains from the upper stories should be suspended from the basement ceiling, unless the use of the room makes this prohibitive, and brass cleaning screws should be provided at frequent intervals to facilitate the removal of insoluble articles.

The exact arrangement of waste and soil pipes, the ventilating of the system by secondary pipes, is so complicated that its description is beyond the scope of this work, and should be entrusted only to competent contractors and based on a thorough specification.

Where city drains are not available it will be necessary to install a sewage disposal plant for the breaking up of sewage and rendering it inocuous, inoffensive, and odorless.

Modern sewage-purification plants first liquefy the organic solids in the sewage in tanks in order to prepare it for aërating beds, sometimes called "filter beds."

The tanks alone are not sufficient. The changes which sewer liquor undergoes in a septic tank are of less importance than the subsequent aëration.

The tanks must be of the right form and capacity to treat the amount and character of sewage discharged into them. The tanks appear to intensify ordinary fermentation or putrefaction, settling a small portion of the solids to the bottom of the tank and breaking up the remainder. This is done by anërobic bacteria. When the liquid reaches the aërating beds it is fully purified by the anërobic bacteria, which cover the filtering material with a film and where the poisonous elements are changed to harmless elements. Such aërating filter beds are usually constructed beneath the surfaces of the soil, for this appears to encourage bacterial activity and it entirely removes the possibility of freezing.

Bacterial activity is largely dependent on natural warmth, hence a frozen bed does little purifying while it appears to operate.

The space occupied by the filter bed may be used for yard or garden the same as though the plant were not there.

Some cities require an open aërating bed, and for such an exclusive space is required.

The bed, like the tank, must be given a certain capacity to do a certain work, but the bed may be placed at some distance away from the tank as conditions on the premises demand.

In time the filtering medium becomes coated with a jelly-like film, and in this film, or coating, live the myriad hosts of bacteria. The poisonous liquids are rapidly converted and a harmless liquid, produced and collected, runs away as water.

The final step in sewage purification and disposal is in getting rid of the water. This may be disposed of by discharging into farm drains, streams, or lakes, or by absorbing the water in the soil, by means of underground ducts laid beneath the surface of the soil. Such systems may be built close to institutions without danger of contamination of the drinking-water supply, of noisome odors, or any other discomfort, but the plant must be designed by experts to be of the proper design

and capacity, not too large nor too small. If they are not properly designed, or if inadequate in size, they will be no better than the old-fashioned dangerous cesspools, which should be prohibited by law, and are in some states.

There are many specialists who design and install such arrangements, but it is well not to select the cheapest, for considerable skill, labor, and material are required to build an efficient installation. Reliable concerns are: The Cameron-Wiley Co.; The Ashby House Sewage Disposal Co.; The Andrews Heating Co.

Water Piping

The water-supply system must be divided into several parts. If the city water pressure is not sufficient to force water to the highest outlets, it will be necessary to install pumps and tanks, so that there will be a cold-water tank system of piping for the upper stories, cold-water city pressure for the lower stories, a hot-water system under tank pressures. In institutions having a system of refrigeration a system of drinking-water piping should be installed, and it is very important that this is covered with the most efficient form of covering at every point.

There may also be a system of sterilized-water piping, both hot and cold, with sterilizers and tanks in the power house or in a sterilizing-room situated above the highest outlets.

The hot-water piping should be paralleled by a system of return pipes, so that hot water will flow from any faucet immediately after it is opened; the return piping permits of a constant circulation of the water entering the bottom of the heating tank and leaving the top and will greatly save hot water, which means coal.

A separate system of pipes for fire protection should also be installed, and so situated that water can be thrown into every enclosed space. Unless the city requirements demand a large hose, the hose should not be more than 1½ inches in diameter, for larger hose cannot be handled to advantage except by trained firemen.

It is not possible to place all plumbing pipes in shafts or conduits where they are always accessible at a reasonable expenditure, except where the plumbing fixtures are directly one above another and comparatively limited in number. Such shafts are expensive and require considerable space, but, since the elimination of lead for supply and waste pipes, the danger of bursting pipes has been greatly reduced, and, whereas it may cost from $50 to $100 to repair floors and partitions where they have been broken to repair a broken pipe, it would probably cost thousands of dollars to build shafts and raceways. Waste and soil pipes should be tested by filling them with water to the top, and water-supply pipes by subjecting them to a water pressure much greater than the normal city pressure before they are enclosed in partitions and plastering.

Plumbing Fixtures

Enameled iron fixtures were a great improvement on plain iron sinks, planished copper bath-tubs, and marble wash-bowls, but the gloss of enameled iron is soon destroyed by scouring soaps and stained by disinfectants and solutions used in hospitals, so that a more durable material, such as porcelain or chinaware, should be used for every fixture, with the exception of the scullery and some of the kitchen sinks.

The ideal material is vitreous chinaware, which is dense, hard, glass-like, non-absorbent, the same throughout, and fused on the surface to make the glaze.

At present it is not made into large pieces, such as bath-tubs and large sinks. There appears to be a difficulty in the burning, consequently the older form of so-called solid porcelain must be used for bath-tubs and other large pieces. The glaze on such fixtures is made by firing a glazing material on the mass. This glaze is quite easily damaged, and then exposes the much softer interior mass, which is absorbent and which blackens and stains. Fixtures of such material do not retain their original white color for many years, and on these, as on enameled iron, gritty scouring material should not be used. Solid porcelain is divided into A, B, and C grades by the makers. The A grade is almost perfect, free from flaws, and is desirable for the operating department. The only defects which place a fixture in the B grade are small spots and black lines, called "checks." This grade is very good for every fixture, and sometimes, if an order is sufficiently

Fig. 29.—Double kitchen sink.

large to require a special burning at the potteries, a number of C-grade fixtures can be used.

The design of plumbing fixtures is constantly being improved, consequently recommendations of certain fixtures have little permanency, and it is much better that the purchaser visit the show-rooms of makers or apply to them for their latest catalogues.

The fashion of setting the fixtures away from the walls was made necessary by the form of porcelain fixtures which were first made. They offered no protection to the walls, and these were either continuously splashed and washed, thereby destroying their finish, or protected by a marble or glass covering. The latest forms of porcelain fixtures are designed to be built into the walls, and in the case of bath-tubs into the floors, thereby reducing the number of spaces which are difficult to clean and inspect.

Sinks and wash-bowls are made with high backs, which are in one piece with the sink or bowl, thereby avoiding dirt-gathering joints. These are set prior to the

plastering and built into the walls, greatly reducing the labor necessary for cleanliness and affording few spaces for the gathering of dirt. The form of the fixture for the operating department is not agreed upon by all surgeons, but a deep sink, about 26 by 40 inches, appears to be the most favored, equipped with a nickel-plated stopper actuated by a handle moving either right or left and with a high combination goose-neck supply pipe, the valves of which are controlled by knee-stirrups, or foot-pedals, and which are automatically closed by springs when the knee is withdrawn. This automatic closing is important to save water, especially hot or sterile water, which means *fuel*.

The amount of nickel-plated metal work should be reduced as much as possible by concealing piping in the walls, behind porcelain backs, covering the handles with porcelain, and making the parts which are below the fixture top of brass or iron, which can be painted with thin enamel paint, which requires much less labor

Fig. 30.—Kitchen sink.

to apply once or twice a year than it does to polish the metal at the frequent intervals necessary to keep nickel bright. Inasmuch as constant polishing soon removes plating, white metal or German silver metal work should be used instead of nickel-plated brass wherever the conditions will permit, for it is of the same material throughout without plating.

Figures 29–33 show some of the major plumbing fixtures designed especially for hospital service.

Figure 29 shows a double kitchen sink that may have a drain board on either or both sides. It is a convenient affair, easily cleaned, with a minimum of nickel to keep clean, with the back set into the wall, and is made of porcelain. There may be a metal stopper at the bottom or not as preferred.

Figure 30 is merely a kitchen sink, to which a drain board may be attached if desired. This sink may also be used for an operating department, and when

so used may be equipped with knee-action faucet. In case this sink is used in the operating department, the plumbing may also contain a faucet leading from the

Fig. 31.—Bath-tub on concrete pedestal for children's department.

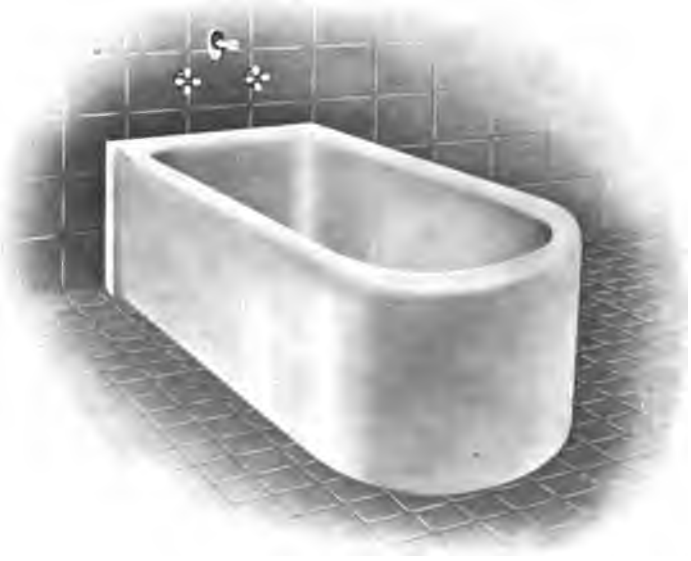


Fig. 32.—Bath-tub set on floor.

hot- and cold-water sterilizers in another part of the suite to a faucet, as shown in the upper part of the illustration.

Figure 31 shows a bath-tub in the children's department set upon a concrete pedestal. Note the entire simplicity of arrangement, without cracks or corners for dirt, and with all smooth surfaces for easy cleaning. Note also the small amount of nickel at the faucets above the tub. This tube is placed so that the nurse can bathe small children without having to stoop over much.

Figure 32 is practically a duplicate of the previous illustration, excepting that the tub is set into the floor. This is for bathing larger children, but this tub on a larger scale is used also for tubbing typhoids and ordinary bathing. Every-

Fig. 33.—Bath-tub set into wall on two sides.

thing is smooth about this tub. It is free from the wall, excepting at the head, where it is set into the wall, so that there are no catch places for dust or dirt. The metal parts are reduced to a minimum, as in the previous case.

Figure 33 shows another form of bath-tub, with the practical repetition of the main factors of the other tubs. In this case the tub is set into the wall on two sides.

These five cuts are reproductions of fixtures in the new Sarah Morris Hospital for Children, which is a part of the Michael Reese Hospital. The fixtures are made by the L. Wolff Manufacturing Co., of Chicago, and they are specially designed for the purpose intended. Heretofore specially designed tubs, either as to shape, size, or material, cost enormously, but the manufacturers are reaching a period in their processes where they can make to order almost any set of fixtures without any considerable increase in cost, which is a great satisfaction to the builders of institutions.

Hot-water faucets should be of the compression type, for these contain a leather washer which is not destroyed by heat. The Fuller type of faucets contains a rubber ball, which is hardened and destroyed by the very hot water usually supplied from steam-heated tanks.

The size of the supply pipes and the size of the openings from the supply fixtures of bath-tubs should be much larger than furnished in the stock fixtures for dwellings, in order to insure a rapid filling of the tub.

Nickel-plated brass pipe or white metal pipe should be of iron-pipe size and gauge. If this is not stipulated, a very thin pipe, not heavy enough for cutting a good thread, may be furnished, and will soon prove a source of weakness.

Wall outlet water-closets bracketed from the wall, and which have no portion touching the floor, present the advantage of an unobstructed view for inspection and insure a clean floor and no hidden spaces. Such closets, equipped with push-button flush valves, appear to be more desirable than the old type of tank closet, whether high or low, but the durability of the valve depends somewhat upon the freedom of the water from silt or sand, for these cut the working parts and soon cause them to leak, except in the case of oil-operated valves.

Fig. 33*a*.—Wall-hanging closet.

Figure 33*a* shows a new style of closet bowl in which none of the parts reach the floor. This is made by the L. Wolff Manufacturing Co., of Chicago.

Kitchen and scullery sinks are subjected to such hard usage that only the most durable material is suitable. Porcelain sinks may be used only for drawing of water, or possibly the washing of berries and small vegetables, but large porcelain sinks, like laundry tubs, are very useful for the washing of potatoes and coarse vegetables.

Slate and soapstone sinks have internal angles which are not easily kept clean, are friable, soon broken by heavy kitchen utensils, and a dark color which may conceal foreign substances. Salt-glazed ware and yellow ware cost almost as much as class C porcelain and is also chipped by heavy utensils. Heavy cast iron is the most durable for such use. Well-made cypress wood sinks are excellent, but they must have brass rims.

The large and deep sizes necessary for this work are not generally kept in stock, but sinks which measure 24 by 30 by 18 inches in depth, all inside measurements, are not expensive, and should be obtained on account of the durability and the facility which the large size affords for rapid and economic work.

Manufacturers of plumbing fixtures make the height of sink tops 30 inches from the floor, the same height as an ordinary table. This height is not convenient, for little work can be done by sitting at the sink, and it is back breaking for standing work, and it should, therefore, be required that special legs be furnished to raise the top of the sink to a height about 35 inches from the floor.

VENTILATION

The subject of ventilation in hospitals is perhaps one of the broadest, most important, and most widely discussed, and yet one upon which there is the least unanimity by doctors, hospital managers, engineers, and architects.

It is understood and agreed by all that nowhere is pure air more essential than in and about hospitals, but the methods recommended for obtaining pure air conditions are about as diverse as the present state of the art of ventilating will permit. The physical and chemic properties of pure air and vitiated air have been studied in a highly scientific manner by many scientists, such as Douglas Galton and A. Wynter Blyth, who explain the mechanism of air contaminations, the loss of gaseous diffusion, and the changes which take place in respiration; and it is not necessary to explain to-day that ventilation, as known, does not destroy the deleterious gases, but dilutes the air, and in successful installations the air dilution is sufficient to purify the atmosphere and make it harmless for rebreathing.

The ventilation induced by fireplaces and flues direct from rooms to the air are helpful in a very limited degree, but seldom under conditions more exacting than those of small residences and the like. Similarly, drafts induced by gas jets or steam coils placed directly in flues, while simple in operation, are effective to but a limited degree when in small units, and when installed to any extent may usually be more economically replaced by fans.

Ventilating openings in outer walls connected with flue type radiators in rooms and air passages beneath floors or in connection with indirect radiators are now seldom used in hospital practice, largely on account of the fact that it is practically impossible to insure proper cleanliness in their use, especially when adjacent to dusty roads or streets.

Small hospitals are designed with little or no provision for ventilation, dependence being placed upon window, transom, and door arrangement for air circulation. This, in many cases, is considered adequate, but, as hospitals of larger size are considered, the complication of the structure itself introduces rooms and departments that cannot be readily ventilated. This necessitates special methods for introducing air changes.

Prominently, for first consideration, is the kitchen, which usually requires fans to extract the excess of heated air. These fans are most frequently attached to a ventilating flue continued from the hood over the ranges. In large kitchens these are frequently supplemented by other fans, either the simple disk or propeller fan placed in openings through an outer wall, or, preferably, the more positive and efficient centrifugal fan, with ducts and registers, to more effectively direct air currents.

In many cases the fans are simply used to withdraw air from the kitchens, its entry being permitted through windows and other openings; however, in many large kitchens the fan system includes fans with ducts for introducing air to the kitchen. These fans must necessarily be equipped with steam-heating coils for cold weather use.

In the larger hospitals, toilet rooms, utility rooms, service rooms, and the like can seldom be adequately ventilated by natural draft, and ordinarily, owing to their grouping, can be connected advantageously by ducts extending up through the building to centrifugal fans in the attic or housed above the roof. The withdrawal of air from these rooms may help ventilate adjacent corridors and halls by being drawn into the ventilated rooms through register faces in the walls or doors leading to the corridors. Often the doors are shortened so as to leave a narrow opening beneath them sufficient for the air-supply requirements. The doors to these rooms are usually provided with springs to keep them closed, and the ventilating system acts most effectively to prevent odors from entering halls and corridors.

The laundry department of the larger hospitals can seldom be so located that at least one or two disk fans may not be advantageously added for withdrawing the heated and moist air. In this department, as in all others, the centrifugal type of fan should be employed where it becomes necessary to use duct work, either to control the source of air supply or to conduct it to any distance for outlet.

The importance of ventilation in assembly rooms, lecture rooms, and the like is now so fully recognized that the larger cities prescribe a legal minimum limitation of air supply allowable for the needs of audiences as based on the seating capacity of the rooms. Here again, as size increases, the possibility of natural or window ventilation frequently will not satisfy the requirements, and artificial ventilation must be resorted to. This usually calls for air introduction by means of fans and through duct work. Such a system must be laid out to avoid objectionable drafts. Heating coils are necessarily a part of this equipment.

Laboratories and similar rooms usually need ventilation to carry off fumes and gases. In these locations small electric fans, placed above the hoods and connecting to outlet ducts or flues, usually suffice. These fans should be especially selected and constructed to withstand deleterious action of the chemic fumes.

Among hospitals of larger extent the design must necessarily bring other rooms and departments into the class where natural ventilation is inadequate, and, as in common with most power-driven apparatus, the larger ventilating units are usually more efficient and satisfactory, so the ventilating needs of the institution are then usually considered as a whole, and it is endeavored to assemble the various requirements for outgoing and incoming air on as few fans as possible by combination and extension of the duct work.

There is no considerable question raised by either medical or other authorities about the advisability of mechanically carrying foul air away from hospital buildings, especially in the parts of buildings above referred to.

With the bringing of outside air mechanically into the building, however, there arise more complications, and there are numerous incidental difficulties and objectionable features to this class of service. Most hospitals must be located in the cities, and frequently in congested districts, where the air is far from clean, and the large amount of air which is always drawn into a building by mechanical ventilation is accompanied by the introduction of large quantities of dust. The economy of the labor for cleaning the building and the saving to decorations and contents by excluding the dust and the air are considerable.

The air which constantly passes through a building is freed of a large percentage of its dust by the change of direction and size of passageways, which deflect and affect the air currents in the same manner in which baffle-plates precipitate chemicals in manufacturing processes. It is, therefore, important that the air intakes are efficiently guarded by air washers, lest the whole building become a sort of gigantic air-filter, and it is fully as necessary to maintain a vigilant observation of the working of the screens and air washers lest they become inefficient, as it is necessary to constantly observe and cleanse water-supply filters in order to be assured that the water supply is reasonably free from impurities.

For cleansing the air, first, various types of screens, and, more recently, air-washing devices, which are virtually artificial rainfall producers, have been developed in connection with the fan outfits. These last have attained a high degree of efficiency, and the control of humidity has been developed in connection with them to such an extent that the quality of air can be ordinarily kept equal to, or, where required, can be modified to be, in general, more satisfactory than the exist-

ant outdoor air conditions. During the hot months the air may be cooled to an appreciable extent in its passage through the cold-water spray.

These systems cannot, however, be fully 100 per cent. efficient, and, further, in spite of watchful attendance, they may at times be shut down. Eventually, then, some considerable dust and dirt will find its way into the various air passages and ducts, and thence become disagreeably evident at times. Accordingly, the only proper duct work for inlet air passages in a hospital is such that, by its size and smooth hard interior finish, will admit of thorough scrubbing and disinfection in common with the rest of the hospital walls and fittings as frequently as inspection shows the need. This facility for cleansing should extend to all the detail construction of the apparatus and passages in contact with the washed air.

No doubt this method of construction, if adopted, will do away with practically all the reasonable objections to mechanical introduction of air to hospital rooms. An exception would be the operating-rooms, where the air-supply registers should be provided with some form of efficient, antiseptic air-filter.

Air drafts are a troublesome feature in ventilated rooms. The ideal air condition for some persons being still air, any degree of air movement will be more or less strenuously objected to by them. These objections can usually be properly done away with by furnishing the registers with dampers which may be readily adjusted to suit individual needs.

It must be realized that any extensive ventilating system, or one in any way complete as a whole, is quite a considerable installation, and is not only expensive to install, but entails continual operative cost. Like all hospital equipment, it is actively in use, and represents a continuous outlay to produce a continuous definite result; therefore, careful study should be given early in the planning of the hospital to the consideration of just what equipment in the individual case is necessary, what is advisable, what advantages, what ends are to be attained, and at what disadvantage and cost.

The investment and operative costs must be carefully weighed. All of these, in common with all the engineering equipment problems, require expert consideration and the advice of those broadly experienced in the specialized problem at hand.

Many modern hotels are equipped with elaborate air-washing and tempering devices, especially in their assembly halls and restaurants. But this is extremely costly apparatus, both in first cost and maintenance, and no attempt has been made on any considerable scale to extend such an equipment to private rooms of guests, with the exception perhaps of an isolated "royal suite" in some fashionable hotel. There is no such equipment at work satisfactorily in any hospital anywhere, and, until the art of mechanical ventilation is farther developed, we might safely stop when we have provided the kitchens, serving rooms, and utility rooms with this feature. In building large and costly hospitals it might be well to install metal or porcelain ducts of large size and a pattern that can be reached for cleaning, so that, when the problem of air washing has been solved, the machinery can be installed with small cost and without disturbing the walls.

REFRIGERATION

As the proper preservation and condition of foods and the purity of water supply are of the utmost importance in hospital service, so the refrigerating requirements are most exacting. The advantages of refrigeration in hospitals include the cooling of main kitchen and diet kitchen food-supply boxes, refrigeration in service rooms located throughout the hospital, cold-storage refrigerators for stocks of foods

and supplies, the preparation of such foods as ices, ice-cream, and delicacies for the sick.

In modern hospitals the service and similar rooms are quite commonly served by dumb-waiters, and located as nearly as possible above each other throughout the building. This facilitates the installation of refrigeration piping to the boxes in these rooms, as pipe shafts can readily be laid out for this purpose in the partition walls between them.

The well-known advantages of artificial or mechanically produced refrigeration over coiling by means of ice make this the method to be preferred in any case. If the hospital is small, and natural ice always obtainable at low cost, there may be a saving which, for financial reasons, would make the use of natural ice a necessity. A decision in choosing between the two methods should only be made after a careful consideration, and after having obtained expert engineering advice, based upon an estimate of the investment and operating costs under the local conditions as to cost of ice, power, supplies, labor, and equipment. The type and size of refrigerating equipment and the details of the machinery proper and accessories should be similarly decided.

The advantages of mechanically produced refrigeration are primarily the ability to keep the various refrigerated boxes or spaces at any desired low temperatures and to control these closely, while, at the same time, maintaining the boxes in a far more highly sanitary condition, due to the ability to hold them at a proper degree of dryness.

Refrigerated drinking water is readily available with mechanical refrigeration. The cooled water, when piped in a closed circuit and thus kept pure and clean, can, when refrigerated, be circulated throughout the hospital at any required temperature. This facility has not been available with the use of natural ice.

The freezing of the hospital's requirements of pure ice is an added feature now largely adopted by most hospitals of considerable size.

The mechanical refrigerating equipment requires space for machinery, tanks, and pumps. Adequate space should be allotted in a central location on the lower floor, preferably in or near the power plant or boiler-room, and with electric current (or steam) water-supply and drainage readily available.

Of the several types of refrigerating machinery that most commonly in use is the compression system. This has a gas compressor, driven by either motor or steam engine as the conditions of operative economy may decide. Small units usually are motor-driven and larger ones have engines, which permit a greater economic range of speed and capacity throughout varying weather conditions and requirements.

Ammonia and carbonic anhydrid, commonly known as carbonic-acid gas, are the refrigerating mediums most commonly employed. The ammonia compression machines are most largely in use, as they have been more generally on the market for a number of years, and are built in a large variety as to style and size and by a large number of manufacturers. This is probably on account of the fact that this machinery is operated under a considerably lower pressure than are carbonic-acid compressors, and thus does not call for as highly specialized designing or factory construction.

The carbonic-acid machines, though not built in the largest sizes, have entered the field more largely of late, especially where a fear is expressed of disturbing odors due to gas leaks, the carbonic-acid gas being odorless, while the pungent odor of ammonia is well known. In a properly designed and tested plant this fear need not be a disturbing one, and it is practically offset by the fact that such leaks as

may occur are commonly small ones, which, in the case of ammonia, are promptly discovered and made tight, while the carbonic-acid leak may continue unnoticed long enough to cause an extensive loss of gas and even of operative efficiency or capacity before discovery.

Where plenty of exhaust steam is available the absorption system of refrigeration claims some increased economy of operation, but this system, in the sizes ordinarily required by hospitals, has not been largely adopted, possibly as the process is rather more involved than the mechanical compression system, and not as readily kept up to the best operative efficiency by the class of labor usually available on the hospital force.

As to comparative operative cost, though the ammonia compression system is considered theoretically somewhat more economic than the carbonic-acid gas, practically in the size of units and under the operative conditions existing in hospital requirements, the makers of both types give about equal guarantees as to the cost of power for operation. Theoretically, both the ammonia and carbonic-acid gas are used over and over indefinitely, and there is supposed to be no material expense attached to renewal of gases. In the case of ammonia this is approximately true, because a leak is immediately detected by the odor and is stopped. There is no such safeguard with carbonic gas, since there is no odor. As a matter of fact, in the Michael Reese Hospital, where this latter system is in operation, the expense of gas renewals is a constant one, amounting to approximately $300 per year, and it is significant that the ice-machine makers have developed a practical monopoly in the sale of carbonic-acid gas. This is a feature of this system worth taking into account.

Refrigerating boxes are cooled by two methods, termed "direct expansion" and "brine circulation." In the first, the compressed and liquefied ammonia or carbonic anhydrid is piped directly to the refrigerator boxes, and there passes into the cooling coils through "expansion" valves with fine orifices through which the fluid is vaporized, and expanding to a gas in the cooling coils becomes very cold, thus chilling them. One feature tending to render direct expansion in small coils impracticable is the frequent stoppage of the fine valve orifices by rust, scale, and other solids.

Where brine circulation is adopted the ammonia or carbonic-acid expansion piping is entirely confined in a brine cooler or tank in the refrigerating machinery room, and the brine made of common salt or, in some cases, where very low temperatures are required, of calcium chlorid, is then cooled and thence circulated throughout the hospital to the various refrigerator boxes in a closed piping circuit.

The valves located at the boxes can be set to suit the amount of refrigeration needed by each, and thereafter the brine temperature, being controlled in the machinery room, the required temperature of all the boxes can be thus properly maintained without more than the occasional inspection necessary for the removal of frost, which forms gradually on the refrigerating pipes in the boxes, thus insulating and rendering them inefficient.

In many cases where mechanical refrigeration is installed consideration should be given to the saving in labor, which is effected by having the machinery of adequate capacity to supply the refrigerating requirements easily when operated only through the daytime, and arranged to have only the small brine circulation pump in operation through the night. This is one feature in favor of brine circulation instead of direct expansion system where refrigerating gas is circulated direct through the building.

To eliminate a considerable loss in economy, all the cold piping of the refrigera-

ting system should be protected by a heat-insulating covering of the highest obtainable quality (Fig. 34). Standard coverings are furnished of compressed cork and of wood or hair felt. In selecting insulation it must be kept in mind that a considerable difference in first cost will be very rapidly outweighed by the continued loss of refrigeration due to the selection of a lower quality of insulation.

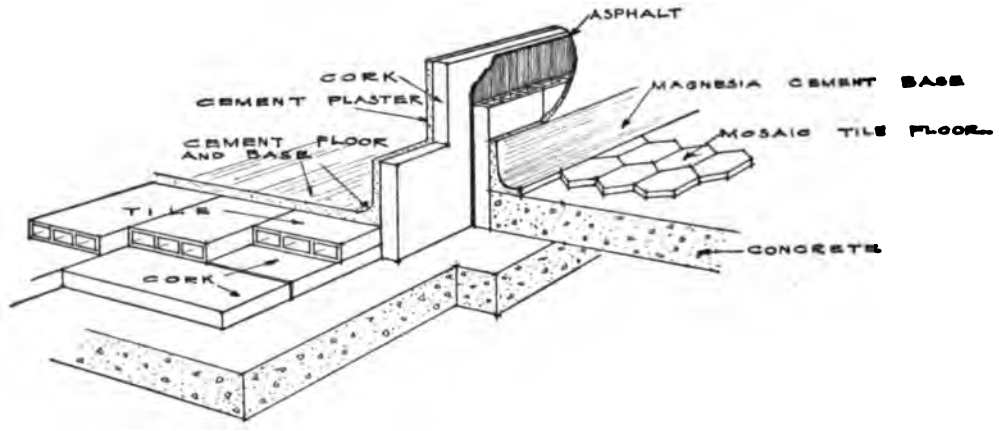


Fig. 34.—Insulating partition between refrigerator and main room. Usually the cork is placed above the tile. The cut is not correct in this particular.

The specifications should establish a guaranteed result of refrigeration and a five-year guarantee against deterioration of the covering. Pipe-covering manufacturers who specialize in refrigerating insulation will agree to such guarantees.

VACUUM CLEANING

Removal of dust and dirt and their attendant bacteria in a manner at once thorough and with a minimum of labor and noise has long been an important problem in hospital management, and mechanical vacuum cleaning or sweeping devices have been adopted by hospitals as rapidly as their development has brought them into the realm of hospital usefulness.

While portable vacuum cleaners or sweeping machines have been developed for use in residences and small buildings, the more exacting requirements of hospitals make it advisable in all cases to install stationary equipment with machines located in the basement or machinery room and connected to a complete vacuum-piping system extended throughout the building. Inlets, with openings conveniently located throughout the building, allow of attachment of cleaning and sweeping tools by means of flexible rubber or steel hose. An objection to the portable vacuum cleaners is that they discharge the air into the rooms which are being cleaned, much of the finer dust being stirred up with the air.

In designing a layout for a stationary vacuum cleaner considerable care should be given to the location of hose-connecting outlets, as long sections of hose cut down the effectiveness of operation quite rapidly. The opening should be so placed that every part of every room may be reached by as short a hose as practicable. Hose is generally furnished in 25- and 50-foot lengths, and longer lines than 50 feet, or possibly 75 feet, are hardly to be recommended.

The tools are usually furnished in sets of from eight to a dozen kinds, the different ones being designed for cleaning various surfaces, such as rugs, bare

floors, walls and ceilings, tapestry, furniture, and clothing, thus individual requirements can be readily met by proper selection.

The number of sets of tools and hose outfits is determined, of course, by the size of the hospital. It is best to have only as many sets as will be required to constantly employ the operators throughout the day by an orderly procedure from room to room in accordance with some regular schedule.

The hose-connecting pipe openings should have tight valves to prevent loss through leaks. A pipe system should be laid as directly as possible and be properly designed as to size, with absolutely smooth interior and with cleanout openings at points sufficient to allow ready inspection in case of stoppage.

Vacuum machines are ordinarily designated by size, as one-sweeper, two-sweeper capacity, etc. The required size is determined by the number of sets of tools to be kept in use simultaneously. The power used corresponds to the work done by the pump, and accordingly the equipment, like the tools, should be selected small enough in size to run nearly continuously with small power rather than intermittently with greater power requirements.

The vacuum-cleaning system operates to effect the withdrawal of the dirt and dust through the aperture in the hand tool along with a strong current of air drawn into and through the hose of the piping system, and thence through dust-separating and cleansing chambers or tanks, by means of a power operated vacuum-producing pump.

The piping system, as before described, is extended from the various outlet locations to the machinery room, where the separating receptacles and the pump with its motor are located.

The piping system can be installed under proper supervision by plumber or steamfitting contractors. Hose, fittings, and the dust-separating equipment and air-pumping machinery are sold and installed ordinarily by the manufacturers.

As vacuum cleaning is rapidly being adopted in many classes of buildings, the speedy development of the field has brought many types of vacuum machines on the market, these necessarily varying in excellence of design and type.

The dust-collecting receptacles are usually metal tanks or boxes, ample in size to properly slow down the air currents, and equipped with baffles, screens, and trays to receive the dirt.

For further elimination of dust from the discharged air some have water sprays in tanks in series with the dry separator, in which case water supplies and drainage to sewer must be connected. When the dry separator only is used the dry-air discharge pipe is ordinarily led away to the outdoor air or to some flue or chimney.

In hospital practice it is advisable, where possible, to lead this air in under grates of boilers or into garbage destructors, so that the discharged air may be thoroughly sterilized and rendered harmless and the dirt consumed.

Among the types of vacuum-producing pumps there are prominently the reciprocating vacuum pump, the positive rotary pump, and the fan-type pump. Owing to the simplicity of construction and smoothness of operation the two latter types are much more prominently in use.

After deciding upon the capacity, the selection of the type of vacuum machinery required should be governed by a comparison of the sturdiness of construction, wearing qualities, smoothness of operation, noiselessness, the economy of power consumption for a guaranteed vacuum produced, and, further, as to general thoroughness and completeness of design.

The motor should be of a standard high-grade design, preferably mounted with

the vacuum pump on a heavy common metal base plate, and connected to it either directly or by a heavy belt or well-designed noiseless chain drive.

Automatic control switches, which either shut down or unload the machinery whenever the sweeping tools are not in use, are desirable, and now usually included with the standard equipments. In small installations, control switches may be advantageously located at each hose connection.

The wiring for such motors and switches should be of high grade, installed in iron conduit by competent electricians.

Hospital administrators need not expect to cut down their cleaning by other means when they install vacuum cleaners. The same amount of hand cleaning will have to be done. Moreover, it must be admitted that in the present state of the vacuum-cleaning art there is very much work that these cleaners will not do. They will clean rugs and carpets, tapestry curtains, upholstered furniture, if such unscientific stuff be a part of the hospital equipment, and they will take much dirt out of the mattresses on the beds and on the nurses' couches. They are not satisfactory for removing the dirt from bare floors, especially wood floors with cracks in them, nor are they satisfactory as wall cleaners, because the best tools made leave streaks after them that do not come off except by washing; and, if we must wash after them, why not wash without them? Their usefulness in cleaning radiators is very limited, since none of the tools made get very far between the coils, and the commercial vacuum will not draw from a sufficient distance to get out very much excepting the surface dust. The furniture cannot be cleaned by the vacuum cleaner, whatever the manufacturers say, because the tools scratch the varnish or finish and soon ruin it.

In short, the vacuum cleaner is a most attractive device theoretically, and has more good "talking points" than almost any other hospital convenience, especially that upon which manufacturers have to dwell—namely, that it removes the dirt from the room instead of stirring it up to settle elsewhere. That would be true, if it did all the things claimed for it, but it does not do so.

ELEVATORS

Modern hospitals, several stories in height, are so largely dependent upon elevator service that the elevators will at once be recognized as a most important item of equipment, which should receive early consideration in the planning of the building.

The efficiency of the hospital service can be largely influenced by proper elevator location. The number of elevators to be installed for a hospital of given size is influenced by the relative location of various departments, the class of hospital, the service offered, and by special features, such as lecture rooms, clinic rooms, and the like, if located on upper floors, and the influence of these various features should be carefully estimated.

The larger part of the elevator service is passenger service.

In large hospitals one freight elevator is usually installed, or, in lieu of this, one of the passenger elevators, properly located, has doors in the car adapted to freight service, to which it may at times be given over.

In selecting the type of elevator the aim should be to obtain that which gives the greatest range of speed combined with absolute smoothness of running and certainty of control. In general, the hydraulically operated types of elevator most nearly fulfil these conditions. These are, in general, somewhat more expensive in first cost than electrically driven elevators, but, if well designed less expen-

sive in upkeep. Moderate speeds are satisfactory in hospital elevator service, and electric-elevator control has been developed to a point where it is now reasonably satisfactory for this service.

The elevator car or cab, if ample in size to readily accommodate a wheeled stretcher and attendant doctors and nurses, is sufficient for the regular passenger service. The laying out of the approaches and the elevator doors should have in view the ready transfer of patients on wheel stretchers or in wheel chairs.

One elevator in large hospitals may, if properly located, be advantageously set aside for the use of hospital servants and those connected with the rough labor about the building. This location, in all probability, would make advisable its use also for freight purposes.

In smaller hospitals the push-button type of elevator control, if installed, allows of operation by the passengers and does not need the service of a regular attendant. This is equipped with automatic starting and stopping devices, controlled entirely by push buttons at the elevator doorways and in the cab. The elevator can be called to any floor by pushing the button located outside the doorway, and the passenger in the car can direct the elevator to any desired floor by pushing a correspondingly numbered button within the car. The equipment is safeguarded automatically to the extent that cars cannot be started or stopped while doors are open, nor can doors be opened while the car is in motion, nor in any case except at the landing where the car stands.

Only those who have been in a hospital as patients appreciate the necessity for eliminating noises of every kind, many of which persons in good health will not notice, but which are extremely annoying to patients, and especially at night.

The operation of an elevator is attended by noises, some of which cannot be avoided, as control devices must make and break electric connections by a snappy movement; so that the machine should be thoroughly enclosed wherever located. It is probably least noticeable in a basement room. If, however, it must be overhead it should not stand directly over a ward, but in a tower directly over the shaft.

Elevator Doors.—On account of fire hazard elevator doors should be made of metal. Light metal doors are noisy. They should be made of heavy sections of steel, and hung on perfectly turned ball-bearing wheels. Heavy solid tracks for noiseless operation of the elevators are essential, and especial attention to attain this end should be given the door construction.

Heavy doors increase the difficulty of operation. There are well-designed door buffers on the market, also automatic-air or power-driven door opening, closing, and locking devices; these, although an added expense, are, in hospital service, most desirable on account of the safety which they insure. They can, in general, be constructed so as to be practically noiseless. The compressed-air devices cost about $100 per opening; the Norton elevator door check about $25. The first opens and closes the door automatically; the second closes the door automatically and must be opened manually.

Special attention should be given to requiring a good set of tracks and wheels for the rolling doors. These are made to range in cost from a few dollars to about $15 a set. In the latter the moving parts are carefully machined and rolled on a continuous row of large perfectly turned steel balls, so that heavy doors may be moved smoothly and easily. The tracks of cheap hangers are made either of stamped sheet steel or thin bar iron which has not been straightened or trued, and, although the faces of the wheels may be turned on a lathe, they jump along the track, and thereby cause noise which is added to the hollow sound given out by the tracks.

Inasmuch as the elevator should be large enough to carry a wheel chair, and in some cases a bed, the full opening of the door should be 3½ feet wide. This cannot always be opened in a single door rolling in one direction, and because of this the doors can be made in two parts, parting in the middle of the opening and each half rolling to either side. The width of the hatchway is sometimes not sufficient to allow the installation of wide elevator doors, unless a two-thirds operating device is used. This moves two parts of equal width to one side simultaneously, and requires a space or pocket only one-half the width of the door, with 4 inches added for the operating device.

The underside of the door-sill, which usually projects into an elevator shaft, should have a slanting sheet of steel secured to it and to the wall below, so that the accidental projection of a stretcher cart or of a person's foot beyond the edge of the car will not result in a serious accident. If the guard is placed at a sufficiently steep angle the car or foot will be pushed away.

If there are two openings in an elevator cab, the one used the least must be protected by a door sliding on the cab or by a folding door.

Solid sheet steel doors, known as art metal doors, with polished wire glass panels are preferable to open iron grill doors on account of partially preventing the travel of noise from story to story.

The best arrangement to exclude the noise of elevator travel and doors from the wards is to arrange a sound lock or hallway between the principal corridor and the elevator shaft. with doors at the corridor. The lock must be large enough to contain a stretcher car and several persons and to permit of opening the hinged doors in the corridor opening.

Elevator Signal Push Buttons.—Signal push buttons at the elevator doors should preferably be designed for two separate buttons, one marked "UP" and one marked "DOWN." These, when wired to annunciators equipped to give similar indication, greatly facilitate prompt elevator service.

Safety Devices for Elevator.—Door-operating devices are now so constructed that they serve to interlock the elevator car and the doors at each floor in such a manner that the car cannot be started from the floor unless all the doors are locked, and no door can be opened except when the car is stopped and standing opposite it.

These devices safeguard the elevator positively from the most common cause of elevator accidents, and no doubt serve to save many lives.

A practical mechanical attachment for this purpose has recently been put on the market and installed in some hospitals. This is designed to be attached to most of the types of elevators now in use and at a moderate cost. Devices of this sort are of vital necessity in public buildings of the hospital type, where the class of passengers and operatives make carelessness probable.

Dumb-waiters.—Dumb-waiters or small service lifts are considered essential in hospital construction. These are installed to run between main kitchens, diet kitchens, and service rooms upstairs, and may, in small hospitals, be hand-operated, but in large hospitals power-driven dumb-waiters are a necessity.

Electric-driven dumb-waiters are now equipped with push-button control, so that they may be automatically called to or from a floor by means of push buttons located at the door openings on all floors. Safety is assured by doors being automatically locked while the car is moving and the car being automatically held at a given floor until all doors are shut.

Other Elevators.—Hand-operated freight lifts of "sidewalk type" are frequently of use in handling supplies to and from hospital basement storerooms and the like.

Small hand-operated or electric lifts are in some cases useful in connection with laundries when located on upper floors, but, as a rule, the modern demand for mechanically operated things almost multiplies the usefulness of anything that contemplates hand operation. Besides, these small openings are dirt catchers, hard to clean, and have been many times suspected of conveying infections from one floor to another. They had better be left out and things carried up and down otherwise.

DIVISIONS OF A GENERAL HOSPITAL

ADMINISTRATION APARTMENTS

The administration apartments of a hospital should be planned to permit the patient or relative to travel in a direct line from the entrance to the point of destination without returning on his or her path. Adjoining the main entrance there should be an open office in full view of the main entrance for an information bureau or orderly's desk. Behind this bureau of information the general offices, as bookkeeper's, superintendent's, and assistant-superintendent's offices, should be located, so that if a visitor has business with any of these employees, he may be directed to them and observed until he has passed into the respective offices, or, if a visitor enters the hospital and wishes to call on a patient and has to inquire in regard to his location and the permissibility of seeing him, such a visitor can then be directed to a flight of stairs or an elevator within view of the information clerk or orderly, the intention being that every visitor should be under the observation of a hospital employee or attendant while in the building, and that the entrance to the elevator should be under the observation of the information desk, the entrances of the elevators at the various floors close to the floor nurse, and so on. A visitors' parlor should be close to the main entrance, and in a large hospital there should be two or three, one for charity patients and their friends and the other for pay patients. These parlors should connect directly with toilet-rooms. It is also desirable to have a visitors' dining-room, in order to control the serving of meals to relatives and friends of patients. Such a room will be an accommodation to such persons as well as a check for a hospital. The size of the institution will govern the rooms for attendants. Every institution should have at least a bedroom and sitting-room for the superintendent, and, where space permits, he should have a dining-room of his own and unquestionably a complete bath-room.

As the size of the institution dictates, there should be a private room with private bath for the superintendent of nurses, the matron, each intern, and the druggist. The interns ought to have their own rooms with private bath, and lounging room and library in common. Inasmuch as any one or more of these may be required at any time of the night they ought to be housed within the building. For the same reason, it is not necessary that the cooks, laundresses, chambermaids, scrub women, and other help of like nature be housed on the grounds.

The advisability of having the nurses housed in a separate building at some distance from the hospital needs no argument. If nurses are housed in the hospital building proper it should be done only temporarily, as, for instance, when isolated with a patient. The ultimate design should be to house them in a separate building. This may be directly or closely connected with the hospital, but it is preferable to have the building separate several hundred feet, in order to give the nurses the benefit of changed environment, a short walk through outer air, freedom from noise, and general atmosphere of the sick. Within the hospital there should be ample toilet facilities, separate toilet-rooms for the nurses, close to their sta-

tions; separate toilet-rooms for visitors of both sexes on the ground floor; toilet-room for office help, for the kitchen service, the engineers, and other male help; also close to the laundry for the laundresses. The nurses and other hospital attendants should not be obliged to use toilet apparatus used by patients.

A floor station for the nurse in charge should be provided on each floor close to the elevator and in sight of it, also centrally and conspicuously located, so that the nurse in charge will be in a position to observe the corridors of the floor and the elevator openings, so she may see visitors and attending physicians when they land on the floor. A recess or alcove on a corridor or a corner can be cut off by a light partition, principally of light metal framework and glass. The space need be only large enough for a table or desk and two or three chairs, with a glass deal

Fig. 35.—Floor station for nurse in charge of floor.

plate and opening through the glass portion of the partition for the handling of papers and small articles. The space should contain the control annunciator or the regular annunciator if the institution is comparatively small. A photograph of such a partition is shown in Fig. 35.

Kitchens, Diet Kitchens, Dining-rooms, Serving-rooms, Etc.

The location of the kitchen should be such that the food will be delivered from the cooking apparatus to the patient in the shortest time, through the shortest distance, and with the least handling. It is not always easy to obtain all of these qualifications, and it is usually necessary to sacrifice one or more of them.

Where rapidly traveling automatic dumb-waiters are used the vertical dis-

tance may be ignored. In large public institutions, where the cost per patient need not be closely calculated and extra help can be obtained at the hands of convalescent patients, the horizontal distance is not a governing factor, for efficiently heated carts can be obtained. In the new hospital at Berlin, Germany, the buildings are scattered over a large area, and the food is distributed by a narrow-gauge electric railway, on which a small electric locomotive, sufficiently large to carry the motorman, is used to draw metal food cars heated by electricity. It is also to be remembered that the food must be distributed unobtrusively, and food carts must not be rolled along corridors used by visitors.

The main kitchen should be connected with the food dumb-waiters or elevators by separate corridors, so that the food carts can be moved to the dumb-waiters or elevators, the food placed on these and discharged from them in the several serving-rooms. The farther away the dumb-waiters are from the kitchen the less likelihood will there be of drafts carrying odors to the upper parts of the house. Inasmuch as the kitchen will probably be placed either in the basement or on the uppermost floor of the hospital building, a separate corridor, such as described above, is not difficult to plan and obtain.

Notwithstanding that a kitchen can be ventilated by mechanical means, it is advisable to have a high story, from 15 to 18 feet is not too high, if the kitchen has a greatest dimension of 40 or 50 feet, and if the kitchen is larger it should be proportionately higher. The high story insures not only good ventilation, provided that the windows extend close to the ceiling, but it also insures a flood of daylight and a consequent purity and cleanliness of the food.

The kitchen is best if above ground, but, if it is necessary to place the kitchen in a basement, not more than 40 per cent. of its height should be below the level of the surrounding ground, and the walls should be exposed to light and air by the construction of areas of ample width and at least as deep as the level of the basement floor.

If a kitchen is built as described above and thoroughly ventilated by mechanical means, there is no danger of having the cooking odors permeate the building, and there appears to be no necessity for using valuable created space on top of a building for kitchen and kitchen service, and having a kitchen on top of a building will remove it from the vegetable cellars, It is true that fully as efficient rooms can be built above ground to serve as vegetable cellars, but only at a great expense, and by using space more valuable for other purposes and leaving cellar space unused which has no other value.

Where kitchens are on the top floor it is necessary to elevate, not only all supplies, ice and coal, but also the help, and a separate elevator will be necessary for this purpose, the cost of which is discussed in another section.

The cost of lowering food on the dumb-waiters is equal to the cost of raising it, and seems no sound argument for placing a kitchen in space as valuable as an upper floor. The air-passage ways from the kitchens to the remainder of the building can be cut off by numerous doors, especially if these are low, in high studded rooms.

The following rooms should be grouped around the kitchen, so that they are easy of access to the kitchen pantry:

A vegetable storeroom, a vegetable preparation room, large enough also to accommodate an ice-cream machine and a mechanical vegetable peeler; a large refrigerator, divided into several separate compartments for meat, fish, milk, butter, and eggs, and for berries, fruit, and vegetables; a small butcher shop, with meat-block adjacent to the meat-box of the refrigerator; a scullery, with special deep

sinks for the cleaning of large kitchen utensils; a large corridor or other place to store the food carts; a dish-washing room and dish room, also with special deep sinks and possibly a dish-washing machine, this room to have dealing counters in large openings in the wall surrounding it, so that clean tableware can be placed within convenient reach of the attendants, and also so that the soiled tableware can be placed within easy reach of the washers. The tableware would only be that used for charity patients and the house help, which will be served close to the kitchen, such as the kitchen help, laundresses, and the help performing the coarser labor. The dining-rooms and pantries for nurses, interns, and others will be described later.

The general storeroom should be close to the kitchen. The room should be sufficiently large to store large quantities of staple groceries and other house supplies in quantity, such as soaps, pails, brushes, toilet paper, and should have a small private office for the storekeeper, with a railing or counter between the room and the entrance. The stores, as required from time to time by the steward or cook, are obtained from this room on requisitions, as described in the sections on Administration, from day to day as required. In direct connection with the kitchen there should be a small storeroom, in which smaller quantities of kitchen supplies can be kept.

In a large institution, where the kitchen and other ordinary help is not housed in the institution, it is necessary to provide dressing-rooms with lockers. The room for the men would contain only lockers, wash-basins, and the toilet-room; the one for the women, however, should be larger, and it is advisable to provide a few laundry tubs, a laundry dryer, and electric, gas, or other facilities for ironing, for, inasmuch as such women usually perform their own laundry work, they can do so between meal hours, and if a space is provided for them they will not use kitchens and other unsuitable places for laundry work.

Soup, vegetable, and stock kettles should not be connected directly with a drain for sanitary reasons, and also to avoid the stoppage of the drains, and it is a good plan to set such apparatus in a row and enclose the floor space beneath them by a curbing, sloping the floor slightly toward one or more cesspools with removable strainers. If the flooring and curbing is made of Terrazzo or other impervious material which water will not affect, the different apparatus described can be cleaned and flushed, and the water can fall into the curb-wall space through the valved drain pipes and escape to the house drains. This arrangement affords an easy and rapid method of cleansing such apparatus. The water from these curbed spaces should be intercepted by catch basins, because the water enters the public sewers.

SERVING-ROOMS

The serving-rooms should be centrally located, and in a private institution 50 patients per serving-room is probably a maximum number, for the serving-room must be large enough to accommodate considerable furniture and a number of people. Each bed should have a tray, and the serving-room should have a tray rack on which the trays with tableware, napkin, and silverware can be placed when not in use. Inasmuch as a tray occupies a space approximately 24 inches long, and should have a clear space of about 7 inches in height, and as the lowest trays should not be closer than 18 inches to the floor, and the highest cannot be more than about 5 feet from the floor, there is space for only six trays in a floor space of approximately 18 by 24 feet, so that the area required for a given number of trays can be easily calculated.

A serving-room should have a small refrigerator for milk, cream, eggs, fruit, possibly a few other items, and a space for a chipped-ice receptacle, so that this will always be convenient for the nurses; a combination gas and steam table; a sink for washing dishes; a cupboard for extra tableware; the dumb-waiter should open directly into the serving-room. A serving-room 11 feet wide by 15 feet long is probably a minimum dimension, and it is not unusual to have a serving-room 16 by 24 feet for 40 or 50 patients. Refrigerators and cupboards should have slanting tops for constant observation as to cleanliness.

Refrigerators, tables, and cupboards should stand on coved bases, the space beneath filled solid with a meager concrete to avoid all spaces which might harbor vermin.

Fig. 36.—Serving-room.

Ash is the most suitable wood to use for drain boards and other woodwork which is subject to water, for it does not stain. The tops of serving tables and kitchen tables are best and most solid if made of strips of maple, about ¾-inch thick and 2½ inches wide bolted together. Laminated tops of this kind will not split or warp.

The tray racks in serving-rooms can be made in several different methods of construction; hardwood is the cheapest, but most difficult to maintain properly varnished and cleansed at the same time. A tray rack can be made of steel pipe, painted with white enamel paint, 16 feet long, and, therefore, large enough to accommodate the necessary number of trays at a cost of about $20. A rack of this kind can be made by any skilled gas- or steamfitter.

Another method is to use steel channels punched with key-hole shaped holes—such channels as are used in show windows. Metal brackets having studs which will engage in the holes are also obtainable, so that a tray rack of this kind can be set up quickly by a house carpenter, and the brackets can be increased in number from time to time or entirely removed. Figure 36 shows a serving-room architecturally equipped, but without table or tray racks.

DINING-ROOMS

The various classes of attendants and help should be separated and have their individual dining-rooms, and the location of these should be as pleasant as possible to preserve the self-respect of the hospital help. The nurses should have a large dining-room, to seat all those who can eat at the same time; an ample pantry, similar to the serving-room, as described for patients. The interns and druggists' dining-room should be served from a similar serving-room. The elevator men, orderlies, and engineers' assistants should have a separate dining-room, and if the institution has male heads of scientific departments, such as resident pathologists, another dining-room should be supplied, perhaps in common with the better class of office assistants, accountants, artists, *x*-ray operators, and other heads of departments

DIET KITCHENS

The diet kitchen should be a complete kitchen, with all of the equipment of a general kitchen, with the exception of the larger mechanical-cooking apparatus; should have the gas range or ranges, steam table, refrigerator, large kitchen tables, deal tables in the partitions, telephone and dumb-waiter connections with the respective floors. Inasmuch as the food cooked in the diet kitchen is for "special diet" and perhaps private-room patients, and since the trays for these classes must be made up, if not entirely prepared, in the diet kitchen individually, it will be necessary to have a larger room, constructed to accommodate a great number of individual trays. A kitchen cabinet is necessary for the storing of small quantities of food supplies and condiments, and many of the ready-made cabinets on the market can easily be made to suit the purpose.

The diet kitchen should be of sufficient size to accommodate a small class of nurses for instruction. A cupboard for note-books and pencils should be provided, also a blackboard for purposes of instruction and general directions and orders. The best blackboards are made of sand-finished green slate with finished and beveled edges. The slate should be secured to the walls by round-headed blue screws, and should have a moulded wooden shelf for the chalk and eraser.

BAKERY

Many institutions do not bake their own bread, and this appears to be an economic question to be decided by local conditions and the administration of the institution. A bakery should be well ventilated and illuminated by windows. It need not be very large, for the modern ovens occupy a space of about 10 by 10 feet. If the bakery is not on the ground floor a strong floor must be provided, for the brick-set ovens weigh several thousand pounds. The room should have running water and two adjacent rooms, one for the storage of flour and the other for the storing of the finished product; both of these should be fairly cool, and they do not require radiation, and it is best not to have steam pipes pass through them, but, if this is a necessity, these should be efficiently covered.

SUN PARLORS

Sun parlors can be placed on southerly exposures, but, inasmuch as they cannot be large in such exposures without covering windows of the most desirable rooms, it is probably best to place sun parlors on the roofs of buildings. In this case an elevator should rise directly to the level of the sun parlor. There should also be a toilet-room on the same floor level. As much as possible of the sun parlor should be made of glass and of light steel framing. Possibly it would be best to have the central portion of the roof of opaque roofing, for the heat in a sun parlor is akin to the heat in a greenhouse, and is, therefore, not pleasant to some patients. These probably feel much better in a reflected light, whereas others will be satisfied to sit in the direct rays of the sun.

Unless the roofs of sun parlors are opaque, the sun glare will always be too great in the summer time for the comfort of most patients. Many sun parlors are practically out of commission in summer on account of the great heat.

The windows must be screened, and at the same time they should be made to open as wide as possible. It is also advisable to provide shades so that the light will not be too glaring, and so that during the hot weather of summer the patients can sit practically outdoors and still in the shade.

If the exhaust pipes of ventilating systems are close to a sun parlor, the piping should be extended several feet above the roof of the sun parlor, and likewise the ventilating pipes of the drainage system should be extended at least 2 feet above the tops of windows in the sun parlor. If the roof surface will permit a number of doors leading to a platform on the roof, provided this is sheltered by a wall on the north or by walls on two or three sides, such a place can be used to advantage for patients. The edges should be protected by high railings, and no place should be left unprotected, so that it will not be possible for a delirious patient to escape from the unclosed space.

APARTMENTS FOR PATIENTS

Location of Private Rooms.—It is most desirable to have the private rooms in a separate pavilion, but this involves the difficulty of longer distances to the operating department and other departments of the hospital for either the private patients or the ward patients, and is a matter which depends principally on the size of the hospital. If the institution is a very large public hospital, of such size that the pavilion system is chosen, it would then be quite natural to provide one or more pavilions for private rooms. In a small one-building hospital, or in a large city hospital of only one building, it would probably be most desirable and best to place private rooms on a floor by themselves, and, if the stairs and elevators are enclosed and good discipline maintained, there can be no objection to having large wards and private wards in the same building.

Having all of the private rooms close together allows great flexibility in a general hospital, inasmuch as many private rooms can be used for any kind of patient. If the private rooms are placed adjacent to and in direct connection with the various larger units, such as male surgical, male medical, female surgical, female medical, and gynecologic wards, their use would be rigidly limited to patients of that particular department, and fluctuations in the number of cases of one kind or another could not be accommodated if the number exceeded the number of private rooms for the particular kind of sickness without mixing the cases in an unsatisfactory manner. This can be done in a small hospital, but would be very inconvenient to the staff and the management in a large institution.

A small number of private rooms closely connected with the wards will be useful in a large institution for patients who can pay a nominal fee, or who are so ill as to require practical isolation.

Details of Private Rooms.—Private rooms may vary in size in proportion to the proposed price, but the minimum size should not be less than 11 by 15 feet, and the management of many hospitals insist on having every private room sufficiently large to accommodate two beds if necessary, and this will require that the dimensions are not less than 12 by 16 feet. It is well to arrange the door and window adjacent to one of the longer walls, so that the head of the bed will not be in a draft. The doors should be 3 feet 4 inches in width to permit the moving of the standard 3-feet hospital bed from one room to another. The general illumination of the room should be obtained by an inverted reflector, such as the *x*-ray system, and this fixture should be placed in the center of the ceiling, low down and controlled by a switch at the bed. There should also be a bracket outlet over the head of the bed controlled by an extension cord switch which the patient can control.

Every private room should have at least a wash-bowl, with running hot and cold water; also, if possible, a water-closet.

At a height of 2 feet 6 inches from the floor, and adjacent to the bed, there should be an outlet box for the portable table lamp, and another for portable examination light on a cord, the table lamp and the examination light to be brought by the nurse as the patient or physician requires. The receptacle for a portable telephone should be placed in the wall at the same time and adjacent to the two electric-current receptacles, and also arranged and finished in a similar manner; the telephone to be of the portable type with a cord and plug, to be brought into the room and connected only when permitted by the nurse. The medical profession is beginning to object, however, to portable telephones, on the ground that they may carry infections from a patient suffering from one disease to a patient already sick with something else. There should also be a receptacle similar to those described, and at the same elevation from the floor, for the signal system, with a cord and push in the control of the patient. Care must be exercised in obtaining keys or sockets which cannot be accidentally interchanged with the electric-lighting socket, and for this reason it would probably be best to attach the signal cord permanently to the wall plate.

In many places no provision has been made to hang the signal cord when not in use. It, therefore, would be well to obtain a push with a ring secured to same and a small brass hook on the wall or on the lighting bracket over the bed.

The question of having a private clothes closet, or not having one, has been much discussed, and some hospital boards believe them sanitary and that no good private room should be without a closet; again, other hospital boards refuse to have them, and maintain that a patient should come to a hospital with only one change of clothing, and that these should be kept in metal lockers in a general locker-room and returned to the patient when required.

The closet adds a number of additional corners and surfaces which increase the labor of cleansing, but there should be no danger if maintained in a sanitary condition. Inasmuch as but little clothing need be stored in them, it is best to build a false ceiling immediately above the door, cutting off a number of feet of useless space and space which is difficult to clean and an unnecessary first cost and an unnecessary cost of maintenance.

The stud height of all private rooms and also the wards must be well considered. A high stud is naturally desirable for a large room, such as a ward, whereas the same height appears disproportionate and objectionable for a private room. Fif-

teen feet for a ward height is not too great, but it will not do for a room 11 feet wide and 15 feet long, so that a compromise must be made and a balance struck by the architect, based on sound judgment, to ascertain the height of stud which will be the most suitable and also the least objectionable for all the different kinds of rooms.

Inasmuch as the floor area and cubic contents of the room is fixed by law in many localities these two factors must be considered. No less than 80 square feet should be allowed for each bed, so that a room of 10 by 16 feet may be used for two beds, but as the cubic contents per patient should not be less than 1200 cubic feet, such a room would then require a stud of 15 feet, but, as this height of stud for so small a room is undesirable, it would be better to increase the floor area, but, inasmuch as increasing the floor area involves greater expense than increasing the stud height, this matter must be carefully considered.

A high studded room may appear more airy than one of a lower stud height, but the difference in temperature in the air of the various heights in the higher room probably interposes greater difficulties in easy ventilation. The appearance of a high small room is very unsatisfactory, and especially when viewed from the bed.

The electric-light plug outlets, telephone outlet, and signal cord should be on the side of the bed nearest the door, so that the nurse will not be obliged to walk around the end of the bed.

The head of the beds should be placed about 1 foot from the wall, so as to place the patient's head in a zone having sufficient circulation of air. The air close to the wall is frequently stagnant. A lounge is often desirable, and is then best placed opposite the foot of the bed, allowing a passageway of 2½ feet, also 2½ feet for the lounge, 6½ feet for the bed, and 1 foot at the head of the bed requires a width of 12½ feet.

Fine large rooms in the best obtainable proportion with openings spaced harmoniously, so that the effect will be that of a refined private dwelling or hotel, will bring a large return. The entire furnishing of such rooms should be of richer materials, of good proportion, good design, but the detailing should be a compromise between hospital details and dwelling-house details. Some of the effect should be obtained by flat decorations; that is, painted work. A room 25 feet square will bring a proportionate return, and these rooms should be arranged so that one or more can be occupied as a suite. Suites of sitting-room, bed-room, bath-room, and clothes closet should be planned; also suites of the same number of rooms with an additional bed-room for parent, wife, or husband of the patient. Such rooms should have every modern convenience.

The window-sills of private rooms should not be so high that the view of a patient recumbent on a bed is restricted too much, but the height of the sill must be compatible with safety.

Private Wards.—Rooms for two or more patients, each paying less than the cost of a private room, are termed "private wards." These frequently have two, three, four, five, or six, but seldom a greater number, of beds. In arrangement they do not differ from the public wards. The patient can obtain a little more privacy, and sometimes selected patients may be grouped according to their social status, the diseases from which they suffer, or their behavior.

Public or Charity Wards.—The number of beds governing the phrase "a large ward" is indefinite. The Hotel Dieu in Paris contained a ward of several hundred beds, and wards with a large number of beds were not uncommon in the middle of the last century, but the tendency has been to decrease the number, so that a ward

of 25 beds is considered a large ward to-day, and, in view of the psychologic effect on the patient, it is probably well that not too many beds are placed in one ward. Each ward should have direct access to its toilet-room and bath-room. A wash-stand for the use of the attending physician in the middle of the ward is a desirable adjunct to the room. Its benefit to the patients is obvious, when one considers that the physician may examine from a dozen to twenty-five different kinds of cases.

The form of illumination for the general wards, in which the illuminating bodies are concealed and where the intensity of the light can be controlled, is almost a necessity in a ward, in order to save the patients from looking at intense points of light. This result can be obtained by using inverted reflectors and Tungsten lamps, reflecting the light on a light-colored ceiling. Strong illumination can be obtained by this method and also a dimmed illumination for the sleeping hours. Where the inverted reflectors are not in use a rheostat or stage dimmer can be installed, and the voltage produced to so low a point that the filaments in the lamps will only glow and afford the nurse sufficient illumination to pass around the room. For special illumination a plug outlet should be provided at each bed, as described for the private rooms, so that the nurse accompanying the staff physician can carry an examination light with a cord and plug, or, in special cases, a portable lamp can be placed on the bedside table. The signal system, cords, and pushes should also be provided for each bed as for the private rooms. If it is necessary to economize, the light sockets can be spaced so that one will serve two beds.

The windows should be spaced in such a manner that the head of each bed will be at a pier, and it is better to have a window each side of each bed than it is to have two beds on one pier. It is also desirable to have the beds placed so that as few as possible of the patients will be obliged to look toward the windows when lying in normal positions.

The floors of wards should not be of ordinary matched wood. Linoleum is probably the best material. A fireplace in the ward is a cheerful addition, and further it will assist in the ventilation.

The equipment and special features of all these administrative units of the hospital are discussed more in detail under the sections on Equipment.

INFECTIOUS DEPARTMENT

The building for infectious cases should contain several suites, each a unit in itself, divided into a room for the patient or patients, a private quiet room, a room for the nurse, and a toilet-room and bath for the patient and another for the nurse; small entry and small kitchen or service-room.

Each of these units should be completely separated from the other and have an independent entrance from the outer air. The nature of the ground where the building is erected may make it necessary to begin the foundations at some distance below the surface of the ground, so that it will be more economic to use the space created by the foundations below the first floor than it would be to build entirely above the ground.

The cases are taken into the separate units by the routes marked "entrances," and attending medical men enter the first one by the same route and leave by the door marked "exit" and pass to the basement, leaving their infected garments in the sterilizing-room, pass through the bath-room, then to the dressing-room, where they will find sterilized clothing, from which room they can enter the lounging-room and remain there and leave the institution with safety to others, but if there

are different kinds of cases in the different units the medical men will follow this routine for each kind of disease. When the patient has recovered and is ready to leave the building, the patient and nurse must follow the same route to the basement and enter the separated bath departments, where they will find clean clothing, after which they can also leave the institution with safety. The windows to the entry and to the kitchen of each suite should be arranged so that packages and vessels can easily be passed in and out. Food can be brought to the kitchen from the main hospital kitchen; the dishes and vessels can be sterilized in the kitchen and placed on the outside of the window-sill, which should be specially wide and suitable for the purpose.

The wards should have a set of adjustable pipe posts, rods, and canvas curtains, so that the patients can be screened from each other if this is found desirable.

A large hospital for contagious diseases may have its corridors arranged with doors opposite each room or at least frequent intervals, which can be closed and sealed, so as to increase the number of beds for one disease and decrease those of another, to accommodate the fluctuating number of cases of the diseases, on the same principle which has frequently been applied in apartment houses to provide elasticity in the number of bedrooms available for apartments.

Inasmuch as this portion of a hospital is not used much, and may stand for months and years without being used, it should be built as economically as will be compatible with safety and durability. Thin solid plaster partitions, enameled iron plumbing, and painted Portland cement floors will suffice.

The technic and equipment of an isolation department are discussed under the section on Isolation and Disinfection.

CHILDRENS' HOSPITAL

For several reasons explained on the following pages a children's hospital should not be directly connected with a hospital for adults. The isolation of the patients in a children's hospital must be more complete, and is a necessity on account of the communicable nature of childrens' diseases from one to another and on account of their peculiar liability to secondary infections. Their resistance to such infections is lowered by wasting disease.

Perfect isolation is easily obtainable in a large institution built on the cottage plan, and can also be maintained in a pavilion plan, but it is more difficult to accomplish this in a small hospital in which all of the patients must be housed in one building. This is likewise the case in the usual city hospital built on the block plan. Small hospitals and city hospitals should be designed and equipped so that they can be divided into separate units by closing doors which are normally concealed in recesses across corridors and by sealing the joints.

Many of the rooms should have French windows opening to exterior porches, so that the isolated portions of the building can be served by way of stairs open to the air.

The institution must be divided up into as many well-separated units as possible, to provide for partial isolation of different classes of diseases. Surgical (clean and pus), medical, skin, gastro-intestinal diseases, and the specialties, eye, ear, nose, and throat, etc.

There must be ample provision for the isolation of patients in small wards and single rooms.

The unit measurements of the architectural features should also differ in a hospital for children from those in a hospital for adults, and it is a mistake to attempt

to maintain the same unit measurements of floor, window, and air space. Inasmuch as the childrens' beds are the smaller, the window spacing should be in proportion, the window-sills ought to be lower, and the stories need not be as high, for their breathing capacity does not require as much initial air space. The stairs should have a lower rise and many other details require special treatment.

Authorities differ as to the patients' ages. They are usually from birth to about twelve years. There are those who claim that the second year should be the dividing line. It is conservative to say that the infants of one year and under should occupy separate rooms, and in large institutions, where it is possible, they should have separate buildings, for they require separate isolation in some of their sicknesses, and the temperature of the rooms should be much higher for them than for older children; also the diet is different and a separate kitchen is desirable.

The medical staff must decide if there shall be separate departments for medical and surgical patients, or if these shall be mingled in the same wards. It is probably better to separate these services if the size of the institution permits.

There should be separate wards for infants, others for children of two to five or six years, and still others for those from six to twelve years, and these latter must be divided according to sex.

Wards for children should be smaller than those for adults, probably not over 10 beds. Advantages of the small wards are: there can be better separation of service, age, sex, and of cases according to severity and type of disease; also, epidemics are checked quicker, and are not likely to extend so far when only a small number of patients have been exposed.

There is a constant possibility that measles, mumps, whooping-cough, scarlet fever, and other diseases may break out and infect all of the exposed children, which is the strongest argument in favor of small wards, and the important point to consider in arranging a hospital for children different from a hospital for adults.

The wards for children up to two or three years of age should be arranged to permit isolation more rigid than is necessary for older children. In the case where the childrens' department is part of a general hospital the age limit may be placed at seven years, but, where it is a separate institution, children up to twelve or fourteen years of age are generally admitted.

There must be quiet rooms for nervous cases and for critically sick children, so that their parents can be with them.

The question of how many children to have in one room is of great importance, and experience has demonstrated that the incidence of an epidemic usually does not bear relation to the size and position of the room. In place of a small room the box system has been inaugurated, by which is meant the division of the ward by means of complete and incomplete glass partitions into small rooms, each room containing one bed. Some of these boxes are of iron and glass extending from floor to ceiling, each box a complete room; in others, the partitions do not close the room toward the center of the ward. Again, in some of them the partitions reach from the floor almost to the ceiling, and in still others they reach neither the ceiling nor the floor. Authorities agree that the only advantage in the closed partition is to make the nurse more careful, and if it were possible to make her so without this reminder, the partitions would not be required, for each bed should have a number and a corresponding locker. Everything used for the infant, including bed, table, tray, cup, dishes, hair-brush, comb, powder-box, even toys, should have the same number.

These "boxes" are more appropriately discussed in the sections on Isolation and Disinfection. It is certainly proper to maintain as great an amount of sepa-

ration between the sick as possible, but it has been found that nurses are very prone to rely wholly on such "constructive" isolation for safety, and so let down the bars of carefulness and strict cleanliness.

In planning a children's hospital, air space and sunlight for the children are the most important points. The rooms should be well ventilated and sunny and yet the latter can be overdone.

A children's hospital should have a number of separate entrances—namely, a principal entrance for physicians, and possibly parents and friends of pay patients, directors, and auxiliary societies. This entrance should not be used for receiving prospective patients; and, for administration reasons, it is best to have the entrance section connected to the hospital proper by only one door, connecting with the stair and elevator hall, under the control of the person in charge, for it is more necessary with children than with adults that they be protected and have no contact with any one but the physicians, interns, and nurses, and occasionally with parents and friends, and this should be only on occasions when the physician determines that there is no danger. The entrances should be so arranged that visiting can be absolutely controlled and prevented if necessary.

The main entrance should have a waiting space proportionate in size to the hospital itself, one reception-room with women's toilet-room, another for men, and a room with lockers for the attending physicians with an adjoining toilet-room. There should be a separate entrance leading to the kitchen and storerooms for the trades people.

The most important entrance, however, is the one for the reception of prospective patients. The vestibule should open into a commodious waiting-room, where the applicants need not be huddled together or in too close contact. A study of Fig. 37 will quickly explain the arrangement described below:

A hallway from the waiting-room should lead to at least two examination rooms, one of these arranged so that it may be used as a surgical dressing or examination room, and both of them connected to disrobing booths, so that the attending physicians' time can be economized. Sinks with running water should be in each one. Two rooms will be enough for a hospital of 25 patients. A laboratory should be adjacent to the examination rooms, which need not be more than 6 or 7 feet in width and 12 to 15 feet in length. Inasmuch as an applicant may be suffering with diphtheria or other contagious disease, and cannot be received in the hospital, one or two small rooms immediately adjacent to the entrance should be maintained, in which such a patient with mother or relative can be comfortably isolated until arrangements can be made to take the patient to a hospital for contagious diseases or back to its home. These rooms need not exceed 7 by 9 feet, but should have a window, and each one should connect with a separate small toilet-room, containing a water-closet and wash-stand with running water. Sometimes several hours will pass before the patient can be taken away, so that it is necessary to have such an arrangement ready for instant use. The finish and fittings of such rooms should be very simple, so that they can be easily disinfected after use.

After it is decided to accept a child it should be taken from the examination room directly to the entry bath, from which the child's clothing can be dropped into the disinfecting or sterilizing-room in the basement through a trap-door in the floor, and not through a long chute with walls which may become infected. The entry bath-room has a linen closet, so that the child can be clothed with hospital clothing and taken from there to the observation department, which should be isolated from all other parts of the building. The patient's clothing should be

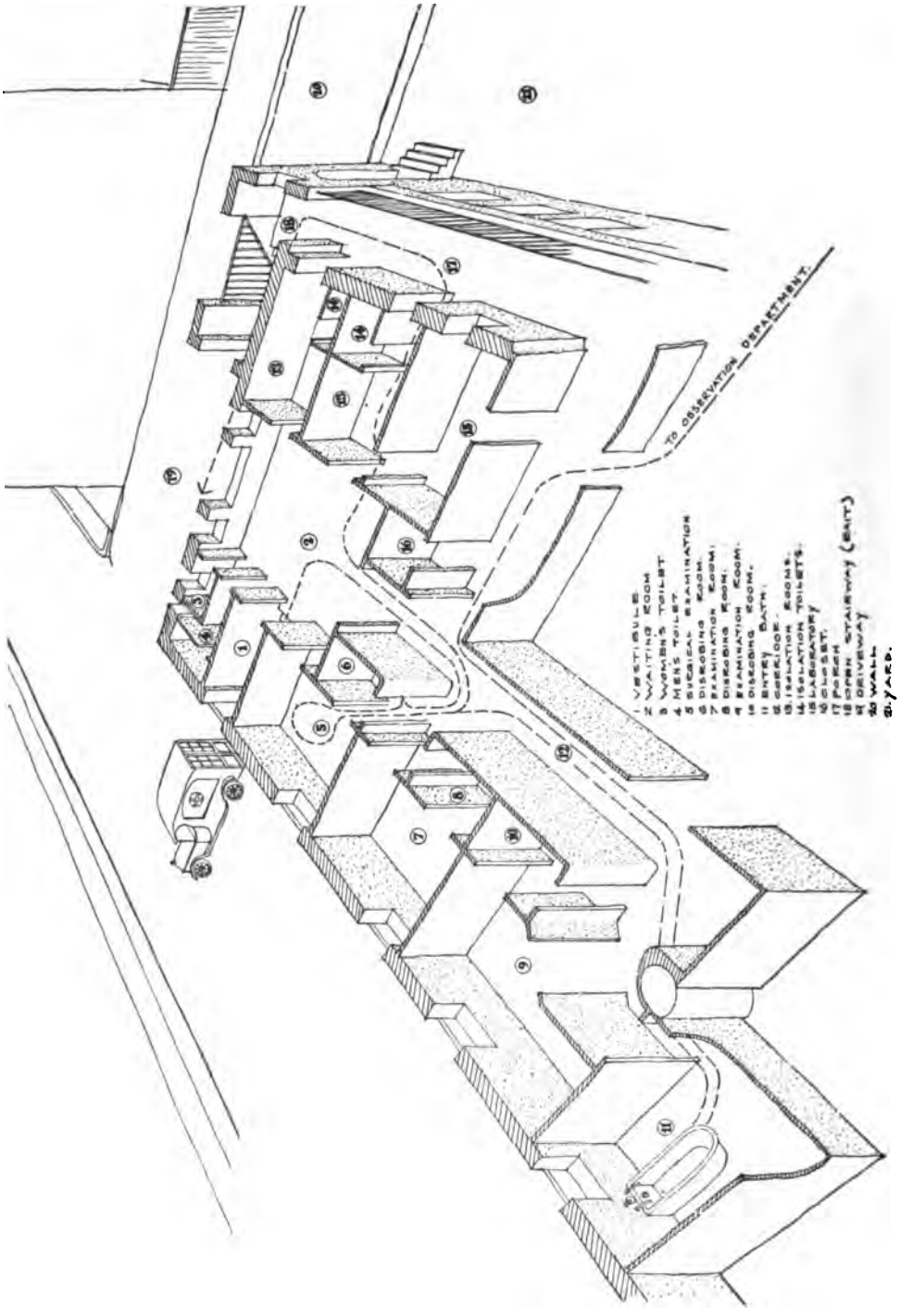


Fig. 37.—Bird's-eye view of children's admission department.

passed directly to a sterilizing-room, where the clothing can be disinfected, bundled, tagged, and stored. In some institutions the child's clothing is returned to the waiting parent, so that the labor of tagging and storing and possibly loss is avoided.

After a child is accepted it should be placed in an observation department, isolated from all other rooms in the building. To make the isolation effective each child should have a separate complete small room, where it can remain isolated for a proper period to determine if it may be safely placed among the children in the hospital proper. Each such room should contain running hot and cold water. Figure 38 shows a series of these observation rooms with glass partitions between, so that a nurse may see through the whole suite at once.

Fig. 38.—A series of observation rooms with glass partitions between.

The observation department will require all of the auxiliary rooms necessary to make it a complete unit, such as a serving-room, milk kitchen, linen closet, cart closet, a slop-sink room, also a nurses' sleeping-room with bath.

General baths are not necessary in this suite, as the children are bathed in bed, and portable commodes are sufficient instead of ordinary toilet-rooms.

The observation department should have one or more complete suites or units, where a patient and a nurse can both be completely isolated if it should become necessary, such suites to include a patients' room, a nurses' room, and a nurses' bath-room with tub, closet, and wash-stand. If necessary, one main room for both patient and nurse will do, but the other factors are necessities.

In connection with the general wards of the hospital, balconies are of the greatest importance, but their value is measured more by the ease of access than by their size and exposure (Figs. 39, 40). They should be conveniently situated,

so that the bed may be wheeled there at any time. Such balconies should be estimated of greater value than play rooms and day rooms. Figure 41 shows a con-

Fig. 39.—A balcony.

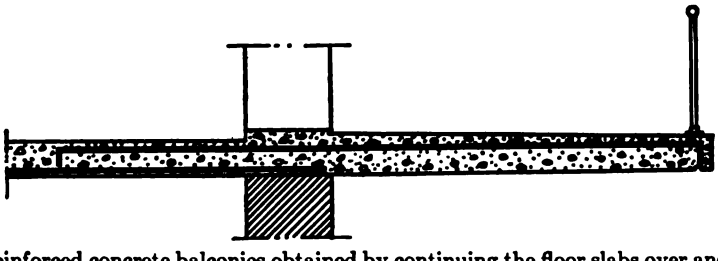


Fig. 40.—Reinforced concrete balconies obtained by continuing the floor slabs over and beyond the exterior walls. A very economic form of construction of durable and fireproof porches.

venient form of window letting on to these balconies from the ward. The serving-room, toilet- and bath-room, day wards, and porches should be in direct connection with the wards, so that they may be under the observation of the ward nurse, and

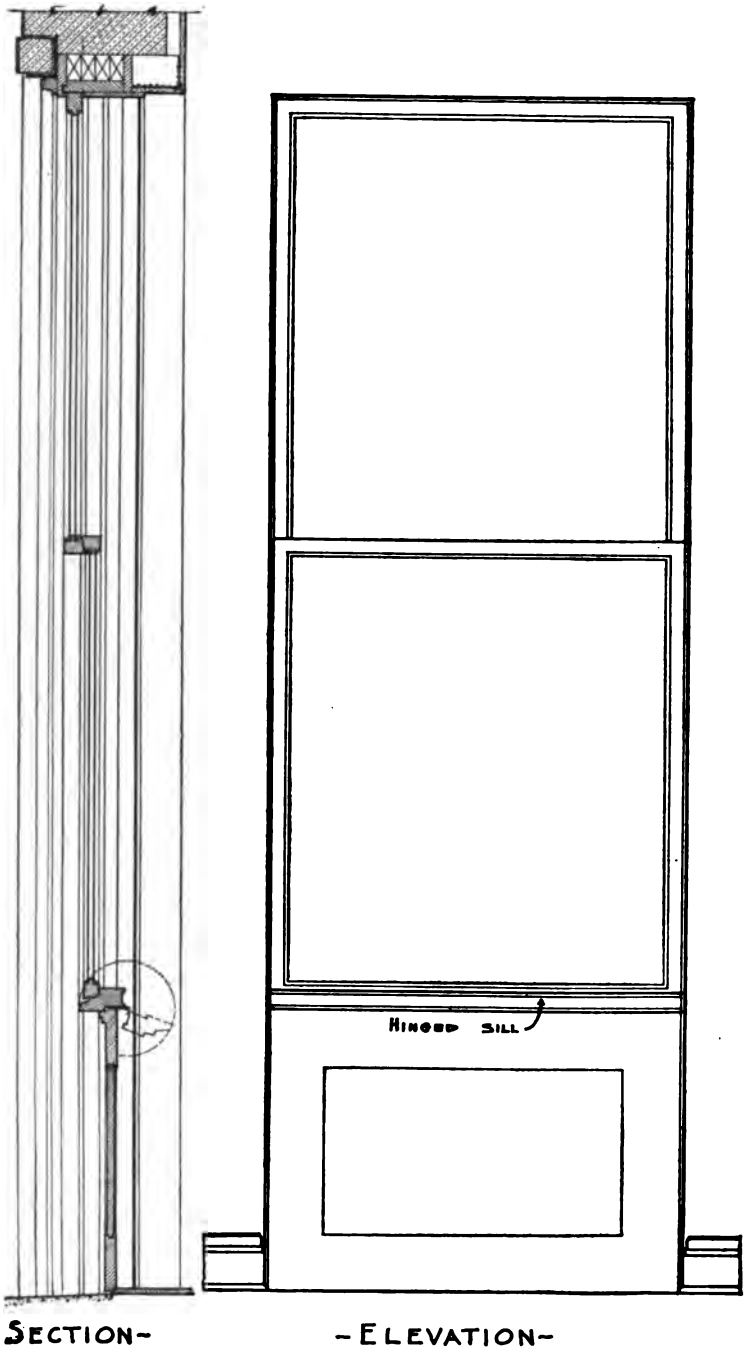


Fig. 41.—Double hung windows opening on balcony. Panel below sill slides up same as sash. Scale detail of double hung window leading to porch with a balanced bottom panel which can be easily raised and leave the passageway from room to porch unobstructed for rolling chairs or beds.

for this the upper part of as many as possible of the partitions should be of glass. The partitions between the day rooms and ward, also between porches and ward, should have only a very light framework of wood or metal and as much glass as possible.

The convenience of the nurses is a point of the greatest importance, and the building should be so planned that a certain number of nurses may care well for the largest number of sick, observe the convalescents at play, and where they will be required to take the fewest steps.

Metal linen closets and medicine cases (Fig. 42), also running water, should be placed in each ward, bathing and toilet facilities nearby; also a small refrigera-

Fig. 42.—Metal closets for linen and medicine cases.

tor and hot plate in adjacent alcoves or rooms separated from the ward by clear plate-glass partitions, so that the nurse may remain in the ward or observe the patients as much as possible.

If the convalescent children can play on balconies, or in sun parlors or play rooms, good administration will require a watcher in each of these rooms, or arrangements that will enable her to see all at once. A large, bright ward and a good balcony offer all that is necessary for the few children who are apt to be up and out of bed at one time. The meals can be well arranged for in the ward itself.

There should be in each department or on each floor a kitchen, laboratory,

linen closet, nurses' toilet-room, janitor's closet, storeroom for wheel chairs, slop-sink closets, and a surgical dressing-room adjacent to the surgical wards. Every ward should have running water, so that the attendants may wash their hands after leaving each patient.

A bath-room adjoining a ward with a window between, so that the nurse can bathe one child and observe the ward at the same time, is a good arrangement, probably better than having the tub in a corner of the ward or in an alcove, but this is often done, and is preferred by some. A small room or alcove arranged for storing milk and other food for the night and warming it when needed, also directly connected with a ward in the same manner as described for the bath, is required and desirable for nurslings' wards.

Details.—Walls in bath, toilet, sink rooms, and floor pantries or kitchens should be tiled about 5 feet high, and if the means permit the walls of wards, day rooms, and balconies should be tiled about 3½ feet high. The tiling should extend into the window reveals and the sills should be of some impervious material, not too high, so as to permit the children to see things out of the window, but it is probably best to slope the window-sills so that the children cannot stand or sit on them.

Radiators should be enclosed in boxes of wire mesh to protect the children from contact with the heated surfaces. No. 18 wire woven into a square mesh of five per 2 inches and galvanized is quite suitable.

Radiators standing against the walls should have hoods to deflect the air-currents from the walls; this tends to a better circulation and protects the wall from becoming blackened.

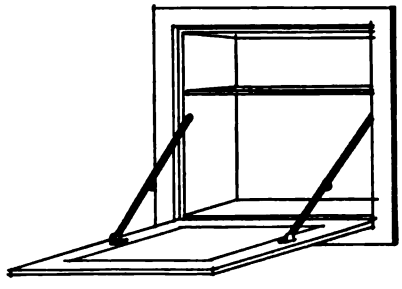


Fig. 43.—Wall cabinet.

Double casement windows and double transoms have the advantage of permitting the passage of the greatest amount of air and may serve as doors to balconies, and when double sash are used the glass does not become obscure by vapor. The child should have a view out of doors, and where the beds cannot be placed so that it faces the windows large mirrors are sometimes provided on the opposite walls so that it may have some view.

Door-sills are not necessary, but in some European institutions the whole floor of the room toward which the door swings is about ½ inch lower than the floor of the adjoining room, so that the lower edge of the door swings against a ½-inch brass edge. This arrangement is also used where doors open on balconies. The portion where the hand usually strikes should be guarded by glass or celluloid.

For every bed there must be a wall cupboard over the bed, with glass door to let down and form shelf. This is to take the place of individual tables, which are costly, unsightly, and in the way. (See Fig. 43.) There must be a small clinical laboratory on each floor. There must be a linen room on each floor and auxiliary linen closets (preferably metal and glass) in each ward.

All medicine cabinets must be self-locking and located in the wards—this and previous features to enable nurses to remain in the wards and not have to go outside to get things; there must be bath arrangements in every baby ward for the same reasons.

The dining-room off of each complete unit is useful, but this can be combined with the porches, and it is better not to create this space for such usage except in the most elaborate construction.

There should be three operating-rooms, one for clean and one for pus cases, and one for minor work, such as adenoids and tonsils, and this last very simple and easily and quickly cleaned, and need not be very well lighted as most such work is done under artificial light.

There should be a serving-room adjacent to each complete unit, fitted with gas, steam table, etc., and so arranged that fluid foods and children's between-meal nourishment can be correctly and expeditiously prepared.

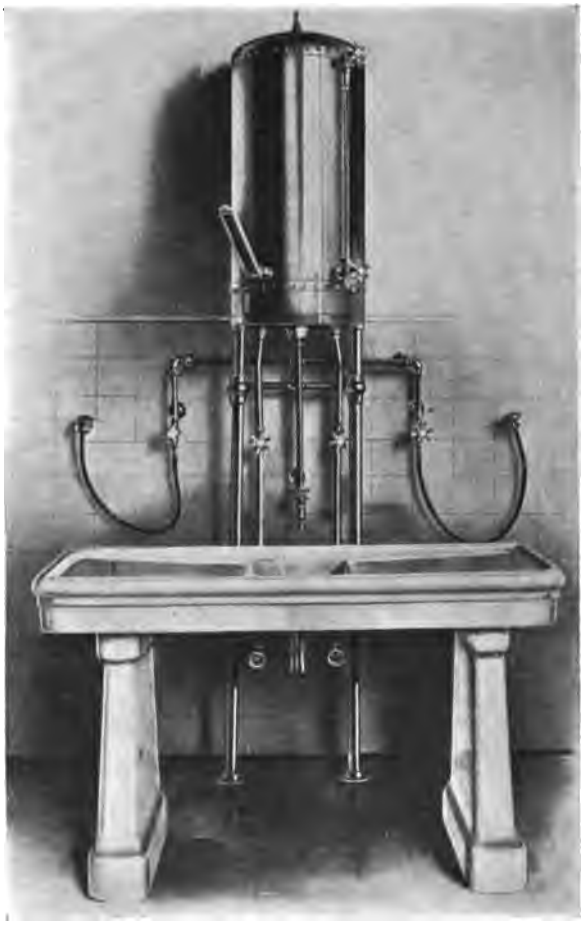


Fig. 44.—Babies' bath cabinet.

There should be an *x*-ray and fluoroscopic room, also fitted with electric apparatus for treatment.

If the childrens' hospital is an adjunct of a larger institution it should have a room fitted for cooking for special purposes in case of necessity to isolate the whole building. Similarly there should be at least a small hand laundry in the basement, with a few tubs and a dryer.

Spaces should be provided for the storage of wheel chairs, bed elevators, and rollers, an incubator room with electrothermo regulator and outside ventilation, a play room or gymnasium for a Zander outfit and for exercising for larger children.

The ordinary form of bath-tub is not suitable for babies. A shallow sink-like tray on a pedestal, which does not require a nurse to stoop, is probably the most suitable; a combination cock with hose and spray nozzle is better than a full tub-bath. Such a device is shown in Fig. 44. It is the design of Dr. Arthur B. Ancker, Superintendent of the St. Paul City and County Hospital. The tank above is connected with the hot- and cold-water supply. The tank is filled and the temperature of the water accurately measured before the bathing begins. It is a delicate matter to place the thermometer so that the actual temperature of the water in the tank shall be taken; a thermometer fixed in a tube outside the tank will not do, because the water then may be stagnant and register either much lower or much higher than that in the tank. Rather the thermometer should be set directly into the tank at an angle, and located as nearly as possible to the point where the water is withdrawn for the baths. Both hot and cold water should be let in at the same time and allowed to stand for several minutes before being used, so that it will be thoroughly mixed. An excellent recording thermometer for this purpose is made by Schaefer and Budenberg Manufacturing Co., of New York (Fig. 45). It permits of the reading record being placed at a considerable distance.

Fig. 45.—Recording thermometer.

A refinement of the bathing plates is now under construction. It consists of a white metal water container, 2 inches thick and long and wide enough to cover the porcelain bath plate, one for each side of the cabinet. There is a funnel-tube at the upper and inner corner out of the way, for filling with warm water from the tank. There are two metal yokes with buttons to fasten the two beds together so they will not move while in use. When not in use the beds can be emptied, dried, and hung up.

Linen cabinets should be numerous and recessed into the walls or partitions in wards and bath-rooms or very close to them.

Railings on stairs and balconies should be of vertical bars with no cross-rods, so that a child cannot find a foot-rest for climbing; probably 5 feet high will be sufficient on balconies, but on stairs they should be even higher.

A large wall clock with a large conspicuous second-hand is very valuable, since the pulse can be counted at any part of the room without contaminating a watch by the infected fingers.

A milk station is necessary, and should contain a separator, a pasteurizer,

peptonizer, refrigerator, a testing table, and an agitator. The power to drive the machinery should be electricity, the room in as cool a location as possible, convenient for the receipt and return of milk cans, and also to the dumb-waiters reaching to the several floors. This milk station is described in greater detai under the section on Milk in the Hospital.

A stationary laundry tub in each sink-room is very useful.

An outdoor play ground for mild weather and a sunny general play room, with gymnastic apparatus or a Zander's outfit for larger children, will be of advantage.

The infants' floor or department should have an incubator room, or possibly a more preferable arrangement is to have small box-like rooms for the same purpose, from 6 to 7 feet square and 7 or 8 feet in height, with constant temperature, thermostats, air inlets, and outlets; air propelled by small electric fans and heated by electric heaters. It is best to make the walls of these rooms of double-plate glass, set and puttied into iron frames, with cork insulation in floors, ceilings, and walls.

The infants' department should also have rooms for wet nurses, with sleeping apartment of their own with separate bath-rooms. Provision should also be made for a number of nursery maids. A few of these will be needed to assist the nurses in the wards to oversee the children on the balconies or at play, or to take them out in perambulators. Nursery maids for service in families are sometimes trained in childrens' hospitals, so that the number of rooms set aside for their use must be governed accordingly. They should also have a separate sleeping apartment with their sitting-room and bath-room.

The wards should be separated into free wards, semiprivate wards for part-paid patients, and also provisions for private-room cases separated from the remainder of the hospital. There should also be quiet rooms for critically sick children, so that their parents can be with them.

If the nurses, doctors, orderlies, elevator men, common house men, maids, and wet nurses do not sleep in the building some provision must be made to accommodate a number of them in times of isolation, so that some places must be so arranged that they may be used for bed- and dining-rooms for such persons.

Inasmuch as children play directly on the floors, it is highly desirable that these be warm and have some elasticity, so that the requirements for a good floor for a general hospital are intensified in a children's hospital. "Battleship" linoleum seems best to meet all the requirements.

The painting is important. It should be of a very good material which will resist scrubbing, as it is important that the walls and woodwork be washed frequently.

The question of wall decorations is an open one, and many believe that the pictures please the decorators and donors rather than the children, and that the latter care very little for them, but if they are provided they should be simple, applied directly on the plaster. Tile pictures have the objection of unpleasantly reflecting light. The monotony of dead-white walls may be broken by an occasional strip of color or small stenciled ornament.

If possible there should be no projecting edges on the walls; flush surfaces should be used elsewhere.

A New Children's Hospital

The Sarah Morris Hospital for Children, just now completed under the direction of the Michael Reese Hospital, Chicago, is believed by the author to contain the last word in childrens' hospital construction, and for that reason the author

believes the plans of this hospital, with some explanatory notes, giving the reasons for certain phases of construction, would be of interest as a contemporary piece of hospital constructive work, and for that reason they are produced here.

Figure 46 outlines the half-basement floor, that has an areaway on two sides of a width of 5 feet, giving full-sized windows for this floor. The space is broken into rather large areas for miscellaneous purposes.

We will begin with the entrance, by way of a tunnel from the main Michael Reese Hospital building, and we first come upon a large kitchen, and adjoining a service-room that is connected by the dumb-waiter with the serving-rooms on the floors above. This kitchen may be at any time employed for its legitimate purposes, but it is contemplated now to feed the childrens' hospital from the main

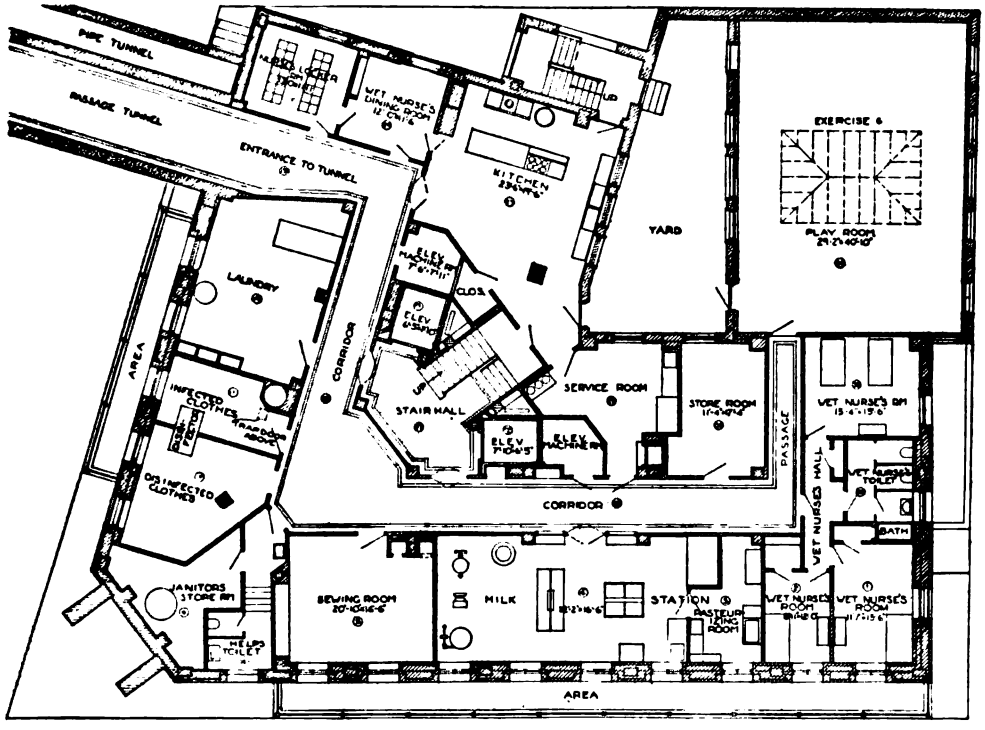


Fig. 46.—Sarah Morris Hospital, ground floor.

kitchen of the Michael Reese. This kitchen, serving-room, and the storeroom adjoining make up a service unit. The next unit is that devoted to the residence of wet nurses. There are three of these rooms that may be used for two wet nurses each and two babies, as the occasion requires, and there are bath and toilet between.

The next area on our way back to the point of beginning is the milk station, which is divided into three rooms, No. 3 being the pasteurizing room, No. 4 the work room, and a third room, not marked on the plans, but beginning where the word "milk" occurs, and taking up 10 feet of space by the full width of the room and devoted to cleaning purposes, that is, the slop-sinks, utensil sterilizer, and so on. The churn, separator, and peptonizer are outside of this small room, operated

from a motor that turns a main shaft running the full width of the room. This complete milk station is shown in the section on Milk in the Hospital.

The next room, No. 5 of the plan, is the sewing and linen room, in which there are shelves and cupboards for keeping the reserve stock of linens for the establishment. It will be noted there are two dumb-waiters connected with this room: one of them leads only to the one floor immediately above, which we will see presently is the observation department of the hospital, and consequently likely to contain communicable diseases. A second dumb-waiter leads to the second, third, and fourth floors, and has no outlet at the first floor. It is thought that in this way the spread of infections from the first floor will be minimized.

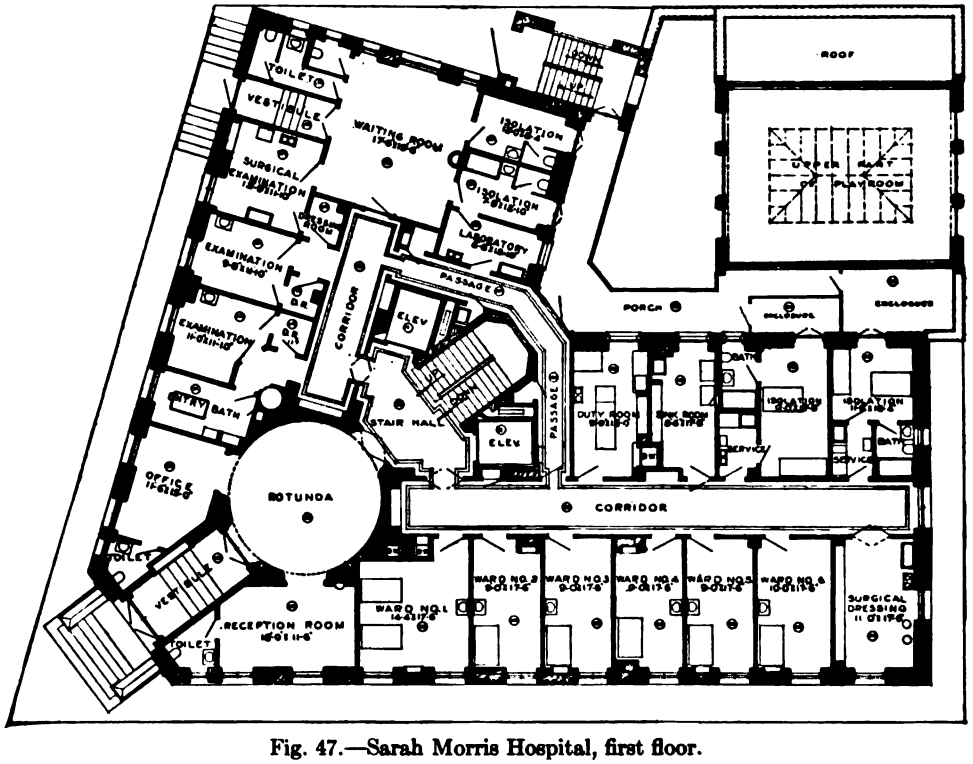


Fig. 47.—Sarah Morris Hospital, first floor.

The next areas of importance form a unit—that is No. 10, a locker room for the childrens' clothing; a soiled-clothes room, No. 11, and a laundry, No. 12. It will be noted that the laundry chute, which we have treated elsewhere, comes down between the laundry and soiled-clothes room, and soiled clothing may be dropped from the floor above, either into the laundry, to be there washed or disinfected, or into the soiled-clothes room, to be treated in the mattress sterilizer, or disinfector, as it is called in the plans. The plan of this disinfector is such that one end opens into the soiled-clothes room, into which the soiled clothing or infected mattresses or other material are put, and the other end opens into a clean room, or locker room, in which the childrens' lockers are kept. The small trap door, indicated in the plans, in the soiled-clothes room leads only from the bath-room of the admission department, one floor above.

This floor contains almost all of the administrative departments of the building.

Over on the corner, No. 34, is a gymnasium or play room for the children, about 30 feet square. It has cement floor, high walls, with skylight and ventilators all above.

Admission Department.—The first or main floor of the building contains practically three units—an admission suite, an observation department, and the executive department, including the entrance, offices, and reception rooms.

Beginning with the vestibule, which is the entrance of the admission department, we enter the main waiting-room, in which there are two toilets and basins, a drinking fountain, and seats for parents and children while waiting. There are three examination rooms, Nos. 112, 114, and 117. It will be noted there are small dressing closets off each of these examination rooms—merely for the purpose of saving the doctor's time; when he finishes examining a child it may be taken into one of these closets and dressed by the mother, during which time he may be examining another child.

When it is finally determined that the child is acceptable, it is taken into room No. 111, marked entry bath, which is fitted with a high bath-tub in the center of the room and cabinets containing hospital clothing; there is also an opening into the laundry chute, and another into a clothes chute, so that the child's bundle of clothing may be dropped into the soiled-clothes room below to be disinfected before being put away.

It may be stated just here that the disinfector below stairs contains one large horse with eight bars, and it is intended to use metal clothes pins to fasten all the clothing of one child to each bar, that would make it possible to disinfect the clothing of eight children at one time, and also to disinfect two or three mattresses at the same time if desired.

Across the hall from the waiting-room are two isolation rooms, each containing basin, toilet, and bath. If it is determined after examination that the applicant has a communicable disease, and for that reason cannot be accepted as a patient, the child and mother are placed in one of these rooms, and kept there completely isolated from all other parts of the hospital until definite arrangements can be made for its care—in this case until the health department of the city can call for the child in its own ambulance. These rooms contain Terrazzo tile flooring and Keene cement walls and ceiling covered with zinc-enameled paint, in order that they may be disinfected with live steam, if necessary, with a 5 per cent. carbolic spray or with formaldehyd spray. There is a small laboratory room, No. 123, for the purpose of examining smears and doing emergency work connected with the admission department.

After the child has been accepted and garbed in hospital clothing it is taken along the passage marked 124 and 125 over to the corridor marked 132, which is the observation department of the institution. Under the section on Childrens' Hospitals a photograph is shown of a vista down through the six observation rooms of this department, with glass partitions between. Each of these rooms is fitted with hot and cold basin. In the figures D. W. are shown the linen chutes or dumb-waiters, one opening into the corridor on this floor, the other going past without stopping. At the extreme end of the corridor, room No. 101, is a surgical dressing-room, intended to be used for children hurt at the time of admission, and not only dressings but minor surgery may be done there. It is fitted with enameled metal cabinets along one side of the room, and on the other side are the sterilizers and sink; a dressing table or small operating table occupies the middle of the floor.

Across the hall from this are two rooms, Nos. 130 and 131, marked "Isolation." In the event that a child occupying one of the observation rooms develops something suspicious so as to make it necessary to remove it from the apartment, and yet it is not desired to take the child into an isolation hospital, it is placed with a nurse in one of these isolation rooms—the door off the corridor is immediately closed and may be sealed. The first small room, as we enter from the corridor, is a service-room, containing sink and drain board, with hot and cold water, a gas plate, and small refrigerator; in the other small room are bath, basin, and toilet for the nurse, since a child in such a situation will be bathed and served in bed. The outside openings to these two suites are porches, each enclosed with high wire fence, and the gates are provided with locks. It is through this outside entrance that food and necessaries of all sorts are brought to the compartment by the orderly, and set upon the porch where the nurse may get them.

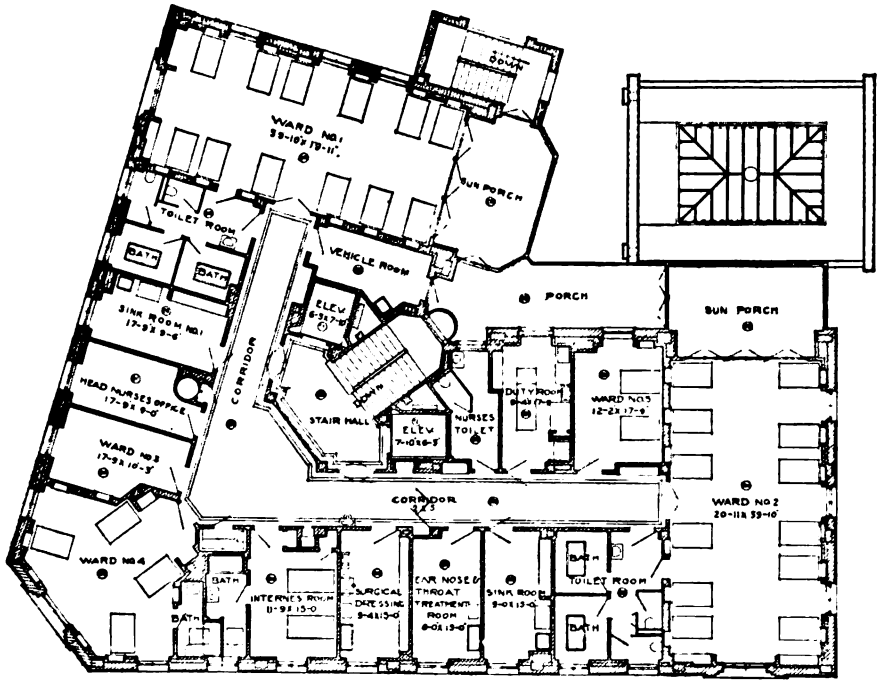


Fig. 48.—Sarah Morris Hospital, second floor.

The serving-room for this floor, marked No. 128, connects with a dumb-waiter from below, and contains a refrigerator, steam table, gas plate, and plenty of tray racks. The next room, No. 129, is the slop-sink room for the department, and contains a metal cabinet 7 feet high and 7 feet wide as a receptacle for bed-pans and urinals, and in which to lock enema cans, hot-water bottles, ice-caps, rubber tubing of various sorts, and the general supplies of that character. This room also contains a slop sink, the utensil sterilizer, and will contain a typhoid stool sterilizer as soon as a proper one can be found or designed.

The Second Floor.—This floor has three hospital units and certain administrative areas, as shown in the plans. It will be necessary only to call attention to the arrangement of the wards and the auxiliary rooms. One of these large wards at

the end of the building is for male children, older than the infant age, and the other for females. There is a quiet room off each one, in which a specially sick child, or one who is nervous, or a child who is dying, may be placed. In the section on Childrens' Hospitals the sun porch and the things relating to them are shown in photograph form.

The furnishing of the ward is extremely simple—a bed, and over the head of each bed a small ward cabinet, a drawing of which is also shown under the section on Childrens' Hospitals.

Attention is called again to the laundry chute, which opens on this floor into the corridor, so that the soiled clothes from the whole floor may be placed in it at a pretty nearly central point.

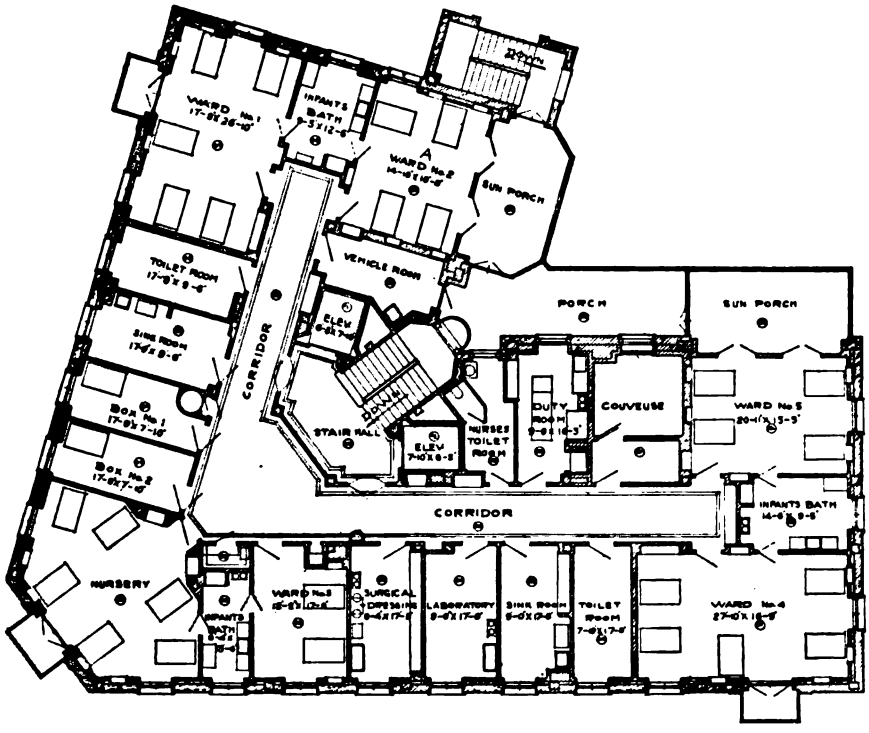


Fig. 49.—Sarah Morris Hospital, third floor.

It will be noted that there are two dressing-rooms on this floor, rooms Nos. 204 and 205—one for the treatment of diseases of the ear, nose, and throat, and the other for miscellaneous surgical dressings.

Infants' Floor.—The third floor contains three complete units for infants. These ward units are practically the same—a sun porch and two wards, separated by the bath. The bath for this latter is given in detail elsewhere. The room otherwise contains a refrigerator, gas plate, and a cabinet for such clothing as diapers, and which is furnished with a small steam coil at the bottom, which may be turned on when necessary to keep the children's clothing warm.

There are two small rooms on this floor which will deserve an instant's attention, "Box" No. 1 and "Box" No. 2. These are merely small rooms in which to keep children that ought not to be placed in the ward or with other children.

Another room which deserves attention is the couveuse, or incubator room. This room is 16½ feet long by 10 feet wide, with a plate-glass partition cutting off a vestibule 6 by 10, in which the nurse may stay out of the greater heat of the incubator room proper. The incubator room itself is a cube 10 feet each way, lined with cork, felt, and asbestos, besides the other normal coverings. There is a double window, with separate double transom, and exhaust fan and an intake fan. It is necessary, in connection with the incubation of premature infants, to have not only the proper temperature, but the proper humidity and the proper ventilation, and these things must be carefully considered before such a room can be considered better than the now almost obsolete baby incubators that are 24 by 18 by 12 inches in size.

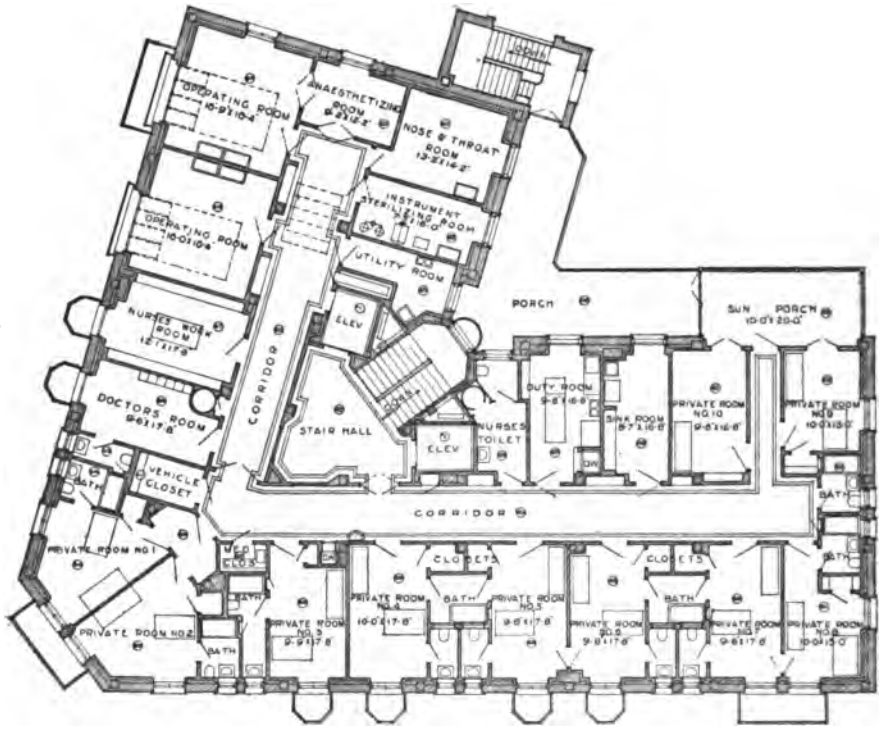


Fig. 50.—Sarah Morris Hospital, fourth floor.

The Private and Operating-room Units.—The fourth floor has two complete units—one made up of a series of private rooms, and the other the operating department. Each of the private rooms has a sun porch, or small balcony, opening off the window, which is the outer opening, double-casement style. Each private room has its own toilet and basin, and there is a bath between each pair of rooms, with double doors, so that the bath may be used either in common for the two rooms or by either one exclusively.

The operating suite contains a surgeon's dressing-room, No. 416; a nurse's work room, No. 417; an anesthetizing room, No. 420, at the end of the corridor; a sterilizer room, and a general utility or janitor's room.

There are three operating rooms—two facing to the north—one for clean and

the other for pus cases, and a nose and throat operating-room facing to the south, and not very well lighted, because most of the work done in this room is done under artificial light.

It will be noted that this suite is entirely cut off from the rest of the hospital, except by way of the elevator and double doors at the end of the corridor, leading to the common stairway, and these may be locked if occasion requires. The elevator has a special opening for this department.

Attention may be called to the stair hall in this, as well as the other floors, because the landings are to be used for sort of reception rooms. The floors in these stair halls are made of art marble, in figures; there is a telephone in each, and they are to be furnished as reception and waiting rooms.

Reverting to the operating department for a moment, it will be seen there are two spaces in the corridor for wall cabinets. These are instrument cabinets, and, like all the cabinets, closets, and receptacles throughout the building, they are made of metal set into the partition flush with the wall.

General Arrangement.—All the corridors, and all wards and private rooms, have a floor, covering of "battleship" linoleum, ¼-inch thick, and set flush with the floor edge of the base cove everywhere, and this base cove reaches out on to the floor for a distance of 6 inches from the vertical wall.

The administration rooms have a floor covering of hexagonal terrazzo flags, 12 inches in diameter; the corridors and all parts of the operating suite have a floor covering of white vitrified tile 6 inches in diameter.

The wall coverings of the building are as follows:

All corridors, stairways, and the rooms in basement, excepting the milk station and service rooms, are of light buff or deep cream color, with ceiling and 9-inch frieze of a still lighter color.

The first, or main floor, which is naturally not so light as the upper floors, is painted in a light steel gray, with 2-inch stencil of a darker color, 10 inches from the ceiling; ceiling and 10-inch frieze being a grayish white.

The second floor is tinted sea green, with ceiling and frieze of a much lighter tint, and 2-inch stencil between of a darker green.

The infants', or third floor, is in baby blue, with ceiling and frieze of a lighter color.

The private rooms on the fourth floor are painted in pairs, but the colors being those that prevail on the floors.

The operating suite throughout, as well as all bath-rooms, slop-sink rooms, and serving-rooms, are all in zinc-white enamel paint.

The general construction of the building is a light-gray brick, with granite and terra-cotta facings, reinforced concrete foundations and floors, mackolite partitions. The window frames are of wood, and all door frames and glass-partition frames are of steel.

MATERNITY HOSPITAL

The arrangements and details of a maternity hospital and its equipment should not differ from those of a general hospital, excepting that the finish of the wards and private rooms may have slightly more grace in the matter of form and decoration and less severity.

A parlor on every floor, open loggias, porches, and sun parlors are very desirable. The special designations are as follows:

Waiting wards and rooms.

Examination, preparation, labor, birth, and rest rooms.

Comfortably furnished rooms for the doctor and nurse, also for the husband or mother of the patient.

Pleasant nurseries, with one or more infants' baths.

Incubator room, such as described in the Childrens' Hospital, also wet-nurses' rooms.

It is only before and during labor that the patient needs much nursing. If she has entered the hospital before labor, it is because she is sick with some complication of pregnancy, and she will need attention. During labor every facility for aseptic surgery will be required, but afterward she is a well woman, just passed through a period of suffering, and before that a long siege of anxiety and nervous tension. Therefore, she needs cheerful surroundings, flowers, sunshine, bright colors, and the company of at least a few intimate friends to share her pleasure at the happy advent of the little stranger.

ARCHITECTURE OF THE SMALL HOSPITAL

The principles of hospital architecture apply equally in the small and the large institution. The radical difference between the two is simply that one contains a very few units and the other a great number of units. In the large hospital there are questions of transportation of food and hospital supplies that do not apply in the small institution. There are questions of light, and perhaps problems of ventilation and heating, that render the scheme of architecture more complicated. We have taken up these questions of light, ventilation, transportation of supplies, and other economies of administration as they apply in any institution, and it will not be difficult for us to apply them, no matter what the size or the purpose or the location, and about the only thing that we need consider here is the economy of arrangement for small units, and a small number of each, considering the fact that oftentimes we will have to use a single unit for a greater number of purposes. For instance, a small hospital of, say, four units, may have to care for all the specialties in medicine and surgery, and facilities will have to be furnished for treatment of all sorts of cases, whereas in the hospital of great size a single unit can be used for a single purpose, which greatly simplifies the architecture.

The hospital unit, as such, has not changed greatly in the past few years, in fact, Florence Nightingale, in her "Hospital Construction," published in 1863, gives us some hospital units that were proper for her day. Figure 4 is produced here from Florence Nightingale's book, merely as an indication that we have not progressed very far in hospital arrangement, notwithstanding the fact that the whole science of medicine has undergone vast changes.

As against these old-time plans, we are producing also plans for small hospitals that have been recently perfected and executed. It will readily be seen that in these plans for small hospitals the proportion of space for administrative purposes must be largely increased, as compared with bed space for patients, and if we consider administrative economies, bed for bed, the small hospital does not compare favorably with the large one, and yet we know quite well that a small hospital can be administered more economically, in point of help per patient, than the large institution. No doubt this is very largely due to the fact that we must have greater hall space; distances are greater, more walking to and fro is to be done. But more important still is the fact that in the large hospitals more work is done per patient, scientific apparatus is employed, arrangements for feeding patients are more elaborate, and what would seem abundantly up to date, and

amply sufficient in the way of scientific care of patients in the small hospital, would hardly be considered up-to-date practice in the large institution.

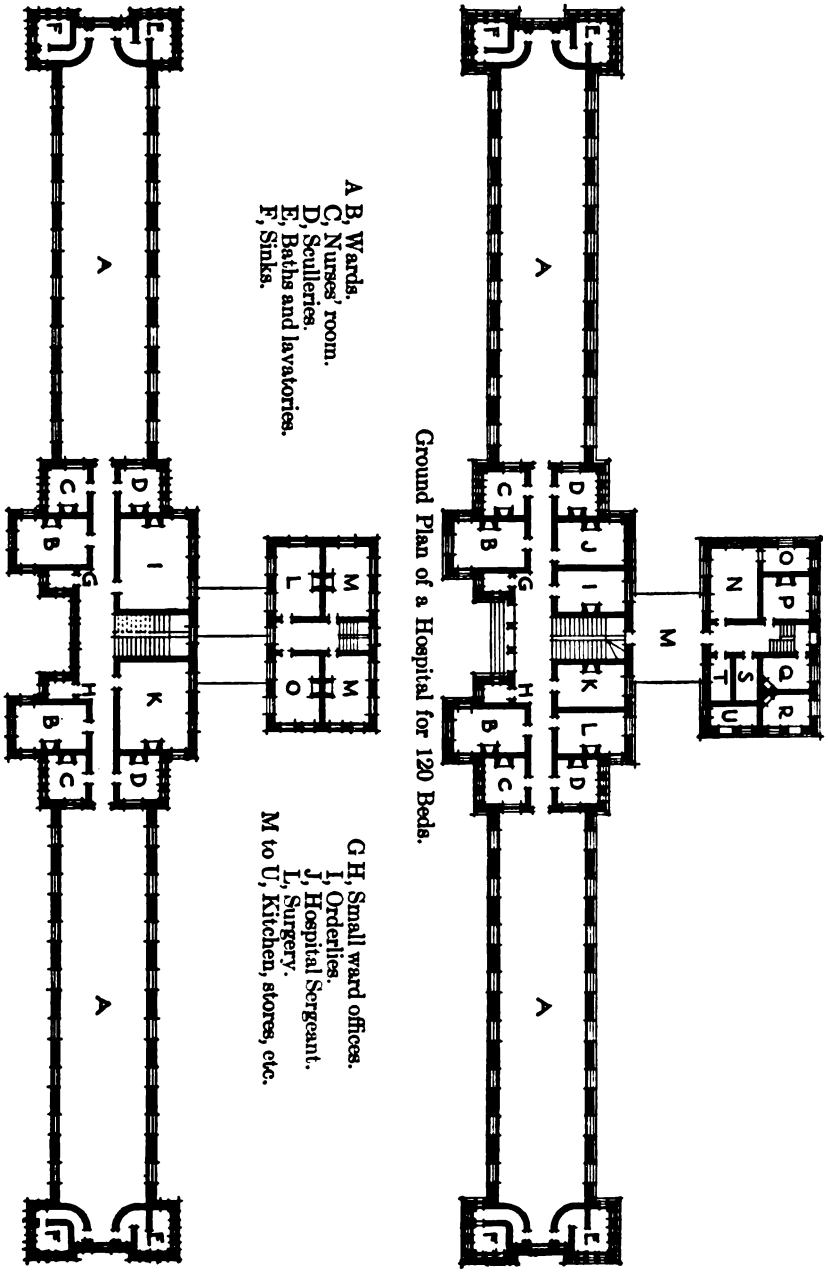


Fig. 51.—Drawing of hospital units from Florence Nightingale's book (page 96).

The following plans carry some illuminating figures and facts concerning construction, especially of small hospitals.

Plan No. I (Figs. 52–55)

The dimensions of this building are 36 feet wide by 79 feet long. The beds are placed as follows:

First floor:	2 five-bed wards	10
Second floor:	5 one-bed wards	5
Third floor:	6 nurses and two housemaids	8
	Total number of beds	23

The legend which accompanies the plan explains the uses of the various rooms.

The following is a synopsis of the specifications:

Concrete foundations, vitrified brick exterior, Bedford stone trimmings, terra-cotta flue linings, steel interior floor supports, yellow pine floor joist, rafters, and

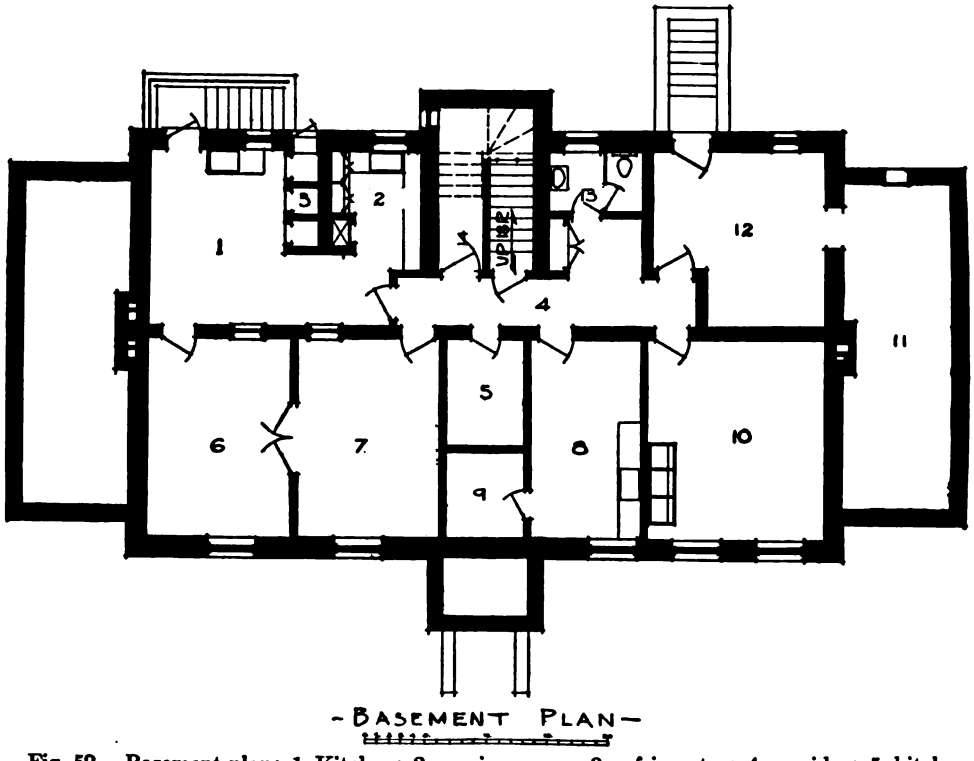


Fig. 52.—Basement plan: 1, Kitchen; 2, serving room; 3, refrigerator; 4, corridor; 5, kitchen storage; 6, helps' dining room; 7, nurses' dining room; 8, drug room; 9, storage for drugs; 10, laundry; 11, coal room; 12, boiler room; 13, helps' toilet; 14, morgue.

studding; metal lath on basement ceiling, elevator shaft, and in dumb-waiter shaft; wood lathing for the remainder; hard plaster throughout, coves of 3-inch radius in all plastered angles, steel corner plates on salient angles; galvanized iron gutters and other sheet metal work, shingle roof, wood columns, and wood floors for exterior porches, steel frame and sash for operating-room window, iron guards for

basement windows; second and third floors deadened with Florian paper, 1¾ inch wood strips, the space between same filled with mineral wool and covered with hard paper. The floor surfaces of the vestibule, operating-room and toilet rooms, magnesia cement; all other floors in first, second, and third floors, first clear white hard maple. The whole of the basement floor finished Portland cement. Stair treads white maple, trim of the halls and corridors in all stories, the whole of the basement and attic, birch for natural finish. The remainder of the building birch for white enamel finish.

The doors, 1¾ inches thick, flush or slab doors. The operating, sterilizing, toilet, and bath-room walls and ceilings enameled with three coats of hospital enamel paint.

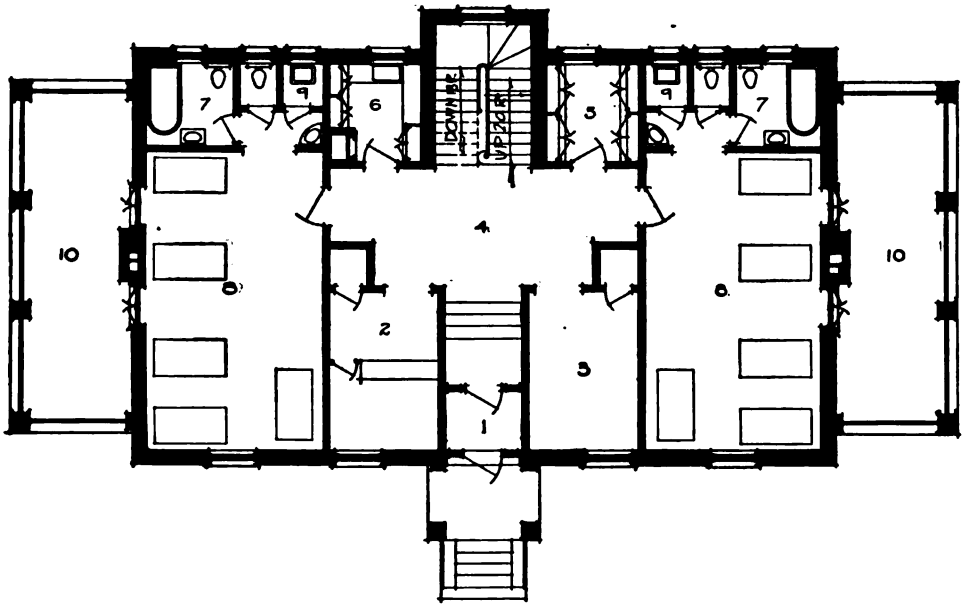


Fig. 53.—First floor plan: 1, Vestibule; 2, office; 3, parlor; 4, corridor; 5, linen room; 6, floor pantry; 7, bath; 8, ward; 9, utility or sink closet; 10, porches.

Floors shellacked one coat and varnished two coats.

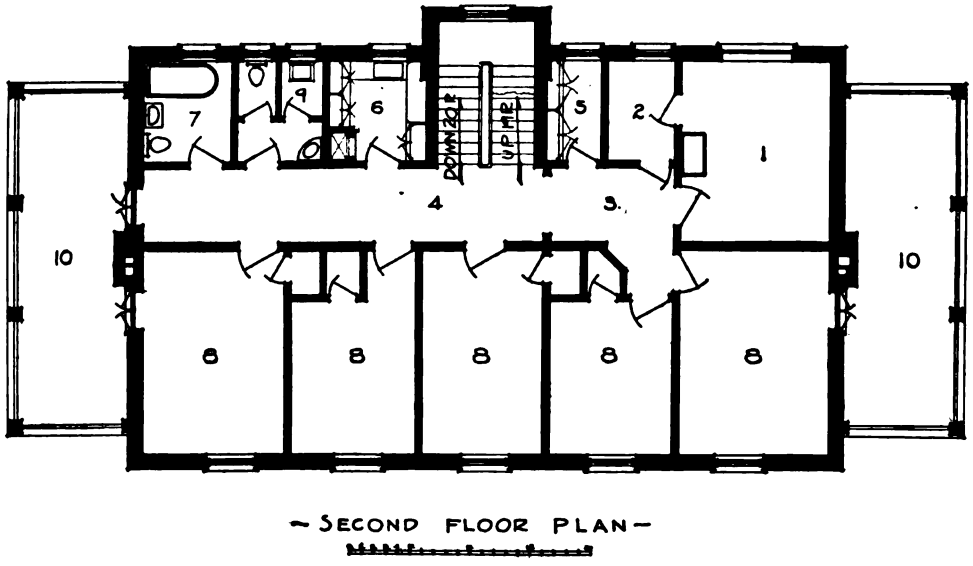
All plaster surfaces not specified to be enameled, a coat of hard oil size and three coats of oil paint, starched and stippled.

The glass of operating-room window and of main entrance polished plate glass. The glass of bath, toilet, morgue, and laundry windows Florentine or Maze pattern glass. All other glass double strength.

Drains and plumbing, according to the best and most modern practice; 2-inch water-supply pipe, water heater, and hot-water storage tank, 9 water closets, 10 lavatories, 5 sinks, 1 three-part laundry tray, 7 bath-tubs, 3 slop sinks, 1 operating-room sink. The operating-room sink to be of porcelain, laundry trays, kitchen sink, and drug-room sink of soapstone, closets of vitreous china, all other fixtures enameled iron.

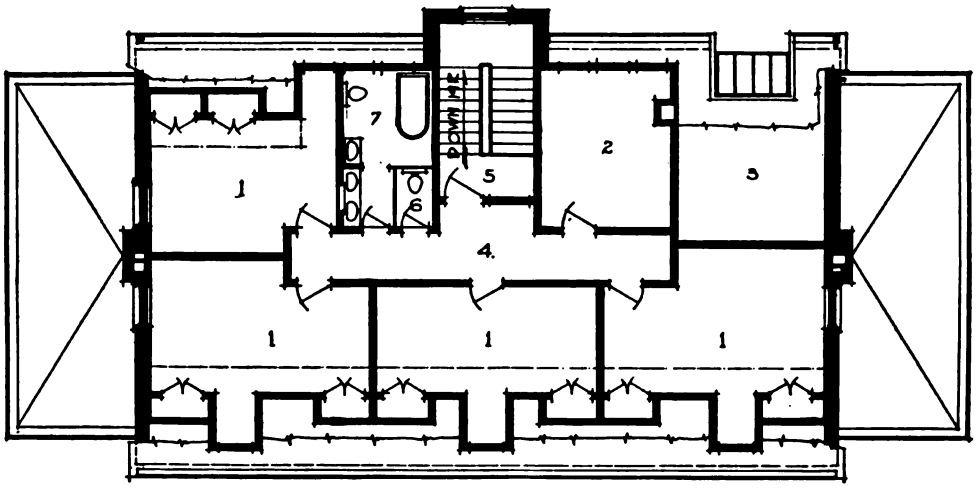
The specifications for plumbing include glass shelves, paper holders, towel racks, soap dishes, clothing hooks at the fixtures where such fittings are required.

The specifications describe a low-pressure steam heating apparatus, cast-iron sectional boiler, cast-iron radiators, and the covering of all mains and connections in the basement.



— SECOND FLOOR PLAN —

Fig. 54.—Second floor plan: 1, Operating room; 2, sterilizing room; 3, operating department corridor; 4, corridor; 5, linen closet; 6, floor pantry; 7, bath; 8, wards; 9, utility and sink closet; 10, porches.

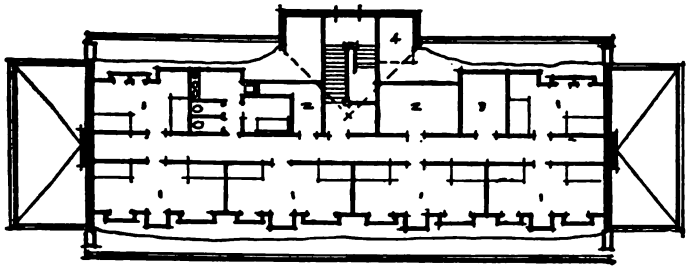


— ATTIC PLAN —

Fig. 55.—Attic plan: 1, Bedrooms; 2, linen and sewing room; 3, upper part of operating room; 4, corridor; 5, stair hall; 6, toilet; 7, bath.

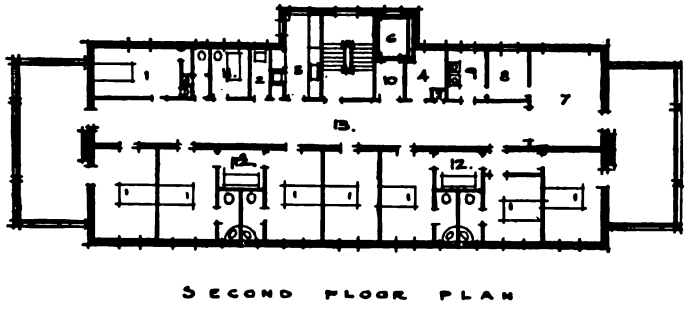
Electric wiring in steel conduit throughout the building.

Insect screens, lighting fixtures, hardware, and tile work are included.



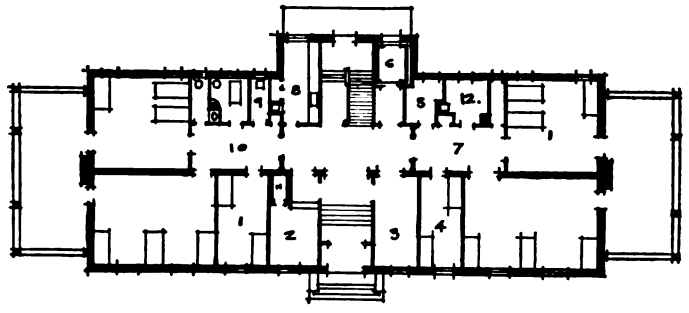
-ATTIC PLAN-

1. Nurses' or female help bedrooms.
2. Storage room.
3. Linen closet.
4. Elevator shaft.
5. Bath and toilet rooms.



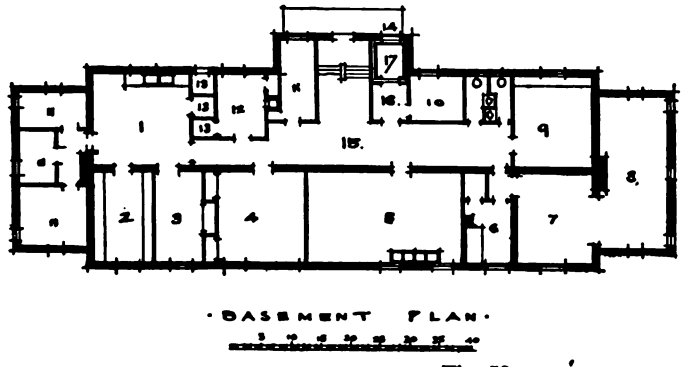
SECOND FLOOR PLAN

1. Private room.
2. Utility closet.
3. Medicine closet.
4. Linen closet.
5. Duty room or floor pantry.
6. Elevator.
7. Operating room.
8. Sterilizing room.
9. Surgeons' preparation room.
10. Antispace to elevator.
11. Public bath and toilet rooms.
12. Private bath and toilet rooms.
13. Corridor.



·FIRST FLOOR PLAN·

1. Wards.
2. Office.
3. Parlor.
4. Interns' room.
5. Linen closet.
6. Elevator.
7. Men's department corridor.
8. Duty room or floor pantry.
9. Utility closet.
10. Women's department corridor.
11. Vault.
12. Public bath and toilet room.



·BASEMENT PLAN·

1. Kitchen.
2. Pantry.
3. Helps' dining room.
4. Nurses' dining room.
5. Laundry.
6. Engineer.
7. Boiler room.
8. Coal room.
9. Drug room.
10. Morgue.
11. Storage.
12. Sewing.
13. Refrigerators.
14. Ambulance entrance.
15. Basement corridor.
16. Elevator antispace.
17. Elevator.

Fig. 56.

The lowest proposals amounted to 26 cents per cubic foot, or $26,260, divided as follows:

General work: viz., walls, floors, roofs, plastering, woodwork, painting, and glass	19.25 cents.
Plumbing	3. "
Heating	1.30 "
Wiring	.75 "
Other Items	1.70 "
Total	26 cents.

Plan No. II (Fig. 56)

The width of this building is 33 feet, the length 111 feet, and contains the following beds:

First floor:	4 three-bed wards	12
	1 two-bed ward	2
	Interns	2
Second floor:	8 one-bed wards	8
Third floor:	Nurses and help	12
Basement:	Fireman	1
	Total number of beds	37

Each of two first-floor wards will accommodate an additional bed, making a total of 39 beds.

The cost of this building, if erected according to the same specifications as building No. I, should not exceed $38,500. The addition of the elevator increases the cubic-foot cost above that of plan No. I. If the three floors and all partitions are built of fireproof construction, and slate roof on wood roof construction, the cost should not exceed $45,000, or about 33½ cents per cubic foot.

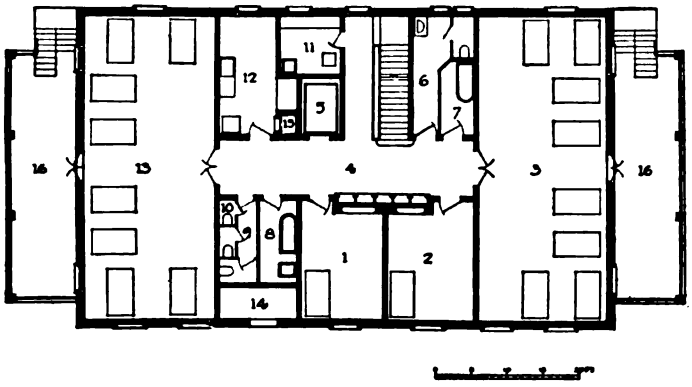
Plan No. III (Figs. 57–60)

This plan differs from plans Nos. I and II by having the operating department on the first floor; the number of beds are as follows:

First floor:	Superintendent	1
Second floor:	2 eight-bed wards	16
	2 private wards	2
Third floor:	Either patients, nurses, or help	18
Basement:	Janitor	1
	Total number of beds	38

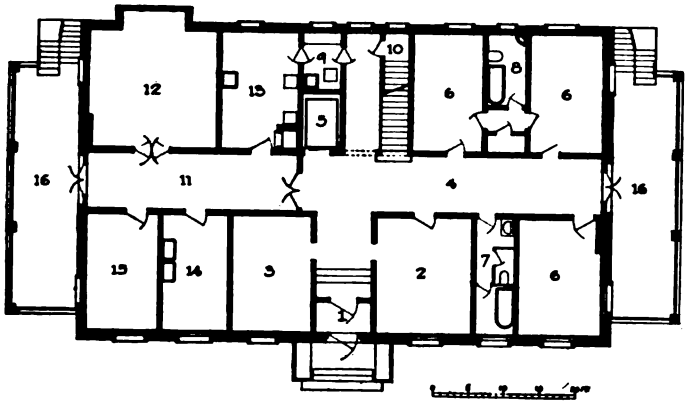
1. Helps' rooms.
2. Nurses' or patients' rooms.
3. Nurses' or patients' toilet and bath.
4. Corridor.
5. Elevators.
6. Helps' bath-room.
7. Helps' toilet-room.

Fig. .57—Plan III—Third floor plan.



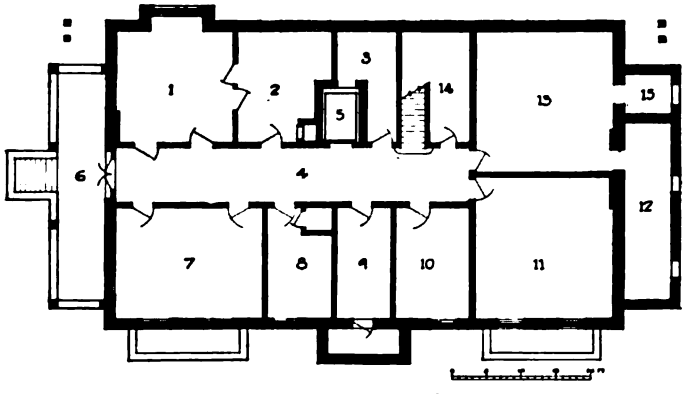
1. Private room.
2. Private room.
3. Ward.
4. Corridor.
5. Elevator.
6. Toilet-room.
7. Bath-room.
8. Bath-room.
9. Toilet.
10. Nurses' toilet-room.
11. Utility or sink-room.
12. Sewing room.
13. Ward.
14. Airing loggia.
15. Dumb-waiter.
16. Porches.

Fig. 58.—Plan III—Second floor plan.



1. Vestibule.
2. Office.
3. Waiting room.
4. Corridor.
5. Elevator.
6, 6, 6. Private rooms.
7. Toilet and bath.
8. Private bath.
9. Utility or sink room.
10. Stairs to basement.
11. Operating corridor.
12. Operating-room.
13. Sewing room.
14. Sterilizing room.
15. Anesthetizing room.
16. Porches.

Fig. 59.—Plan III—First floor plan.



1. Kitchen.
2. Sewing room.
3. Morgue.
4. Corridor.
5. Elevator.
6. Area and basement entrance.
7. Nurses' dining room.
8. Helps' dining room.
9. Storeroom.
10. Man's room.
11. Laundry.
12. Coal vault.
13. Furnace room.
14. Storeroom.
15. Ash-bin.

Fig. 60.—Plan III—Basement plan.

The ground dimensions are 45 by 95 feet, and, if built according to the specification outlined for Plan No. I, its cost should not exceed $46,000, and, with floors of fireproof construction, fireproof partitions, wood construction roof, and slate covering, $52,000.

Plan No. IV (Figs. 61–64)

The length of this building is 130 by 41 feet wide, and contains the following beds:

Basement:	Janitor and fireman	2
First floor:	1 ward	7
	Wards for 1 bed	3
	Superintendent and interns	3
Second floor:	1 ward	7
	Wards for 1 bed	8
Third floor:	1 ward	7
	Wards for 1 bed	5
	Total number of beds	42

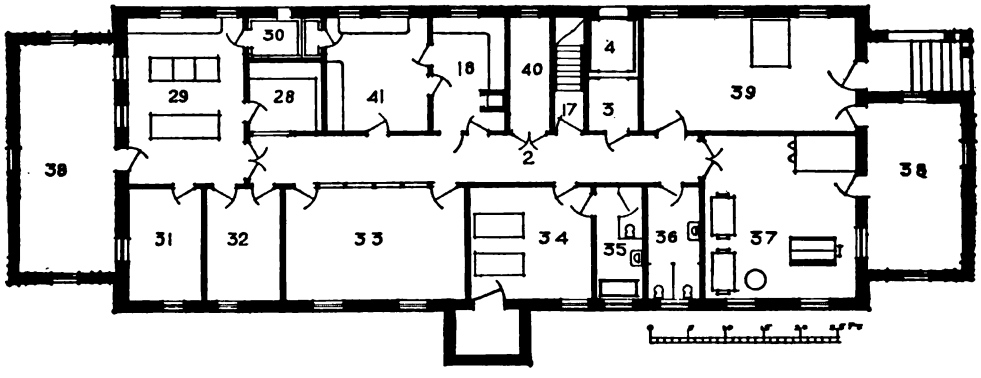


Fig. 61.—Basement plan: 2, Corridor; 3, elevator hall; 4, elevator; 17, stair hall; 18, serving-room; 27, kitchen coal; 28, kitchen stores; 29, kitchen; 30, refrigerators; 31, kitchen stores; 32, helps' dining-room; 33, nurses' dining-room; 34, janitor and fireman; 35, janitor and fireman's bath-room; 36, helps' toilet-room; 37, laundry; 38, coal storage; 39, boiler room; 40, ward; 41, diet kitchen.

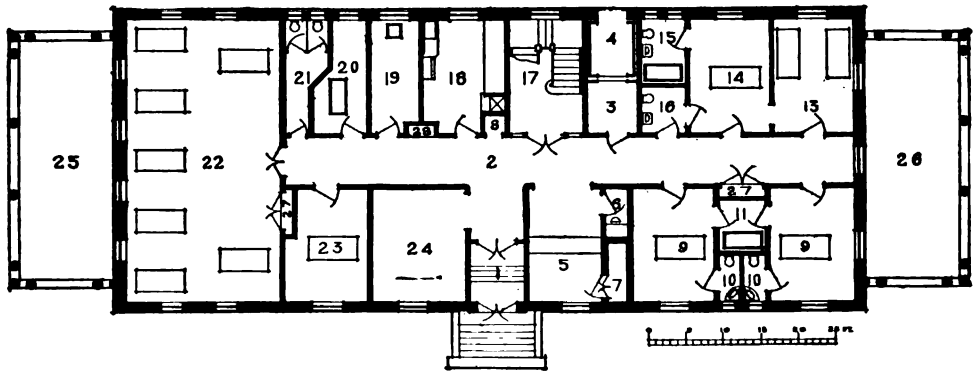


Fig. 62.—First floor plan: 1, Vestibule; 2, corridor; 3, elevator hall; 4, elevator; 5, office; 6, telephone booth; 7, vault; 8, broom closet; 9, private wards; 10, private toilet-rooms; 11, private bath-room; 13, interns; 14, superintendent; 15, superintendent's bath; 16, interns' and public bath-room; 17, stair hall; 18, floor pantry; 19, utility and sink room; 20, general bath-room; 21, water-closets; 22, ward; 23, quiet room; 24, reception room; 25, 26, porches; 27, linen cabinet; 28, medicine cabinet.

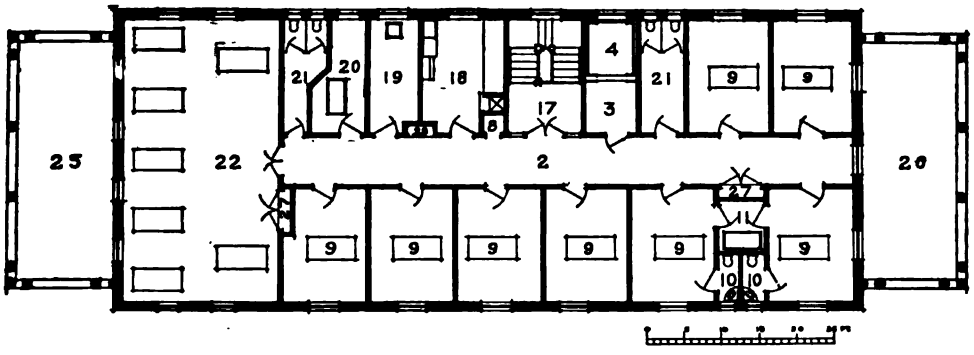


Fig. 63.—Second floor plan: 2, Corridor; 3, elevator hall; 4, elevator; 8, broom closet; 9, private wards; 10, private toilet-rooms; 11, private bath-room; 17, stair hall; 18, floor pantry; 19, utility and sink room; 20, general bath-room; 21, water-closet; 22, ward; 25, 26, porches; 27, linen cabinet; 28, medicine cabinet.

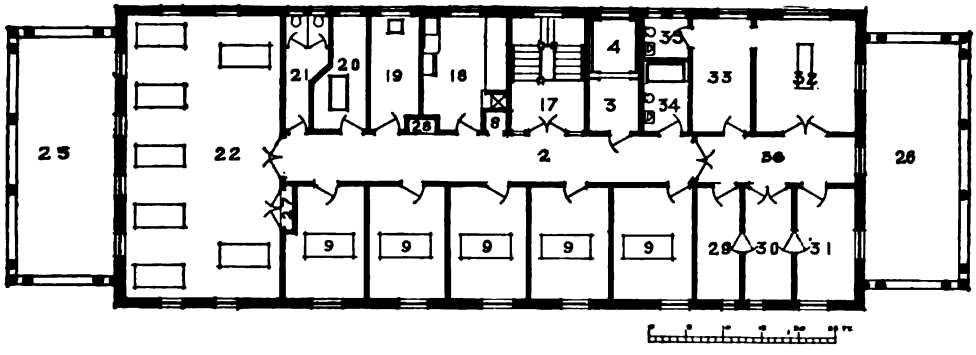


Fig. 64.—Third floor plan: 2, Corridor; 3, elevator hall; 4, elevator; 8, broom closet; 9, private wards; 18, floor pantry; 19, utility and sink room; 20, general bath-room; 21, water-closet; 22, ward; 25, 26, porches; 27, linen cabinet; 28, medicine cabinet; 29, operating-room stores; 30, anesthetizing room; 31, sterilizing-room; 32, operating-room; 33, surgeons' scrub room; 34, general toilet and bath-room; 35, doctors' toilet-room; 36, operating department corridor.

This plan is designed as a three-story building with a flat roof, and will cost approximately $55,000 if built according to the specification outlined for Plan No. I, and $63,500 if the floor, roof, and partitions are made of fireproof construction.

Plan No. V (Figs. 65–69)

This plan illustrates a building in the course of construction in 1912, in a city of about 40,000 inhabitants, on a thirty-acre tract of ground, rolling, partly wooded, and which rises gently from the principal approach to the main entrance, and falls away toward the rear about the full height of the basement, so that the kitchen floor and ambulance entrance, both in the rear of the basement, are level with the ground on their side of the building, and the main entrance only two steps above the driveway grade at the front.

Eventually, the nurses are to be housed in a separate building, and the superintendent will be provided with a dwelling-house, both situated on the hospital grounds; temporarily, they will be accommodated within the building, but later some of these accommodations will be altered for the use of patients.

The building is designed to have masonry walls with stone and terra-cotta

trimmings, floors, partitions, and roof of fireproof construction, copper sheet metal work and slate roof. The floors throughout will be of marble, vitrified tile, ceramic mosaic and Portland cement, the latter for "battleship" linoleum above the basement.

The woodwork will be of hard wood, finished in natural finish in the service portion and for white enamel in the wards, private rooms, and operating department. The cost stated below includes all of the general work, such as mason work, steel, fireproofing, finished cement, ornamental iron, cut stone, terra cotta, sheet metal, slating, composition roofing, plastering, carpenter work and cabinets, cases, painting, decorations of walls, glass, marble, terrazzo, tile, ceramic mosaic floors, weather strips, screens, and hardware, as well as two boilers, steam heating, ventilating equipment, quartz water filters, electric passenger elevator, vacuum-cleaning machine, vacuum-steam circulatory system, plumbing, gasfitting, garb-

Fig. 65.—General view of building and grounds.

age destructor, ash elevator, electric wiring, signalling systems, telephone system, lighting fixtures, laundry machinery, blanket warmer, mattress disinfector, fire hose, refrigerators, and sterilizing equipment.

The main entrance, lobby, waiting-room, and office will have imported marble floors; architectural treatment of walls and enriched ceilings.

Toilet, bath, sink, service-rooms on each floor, and the whole of the kitchen department will have shop-made terrazzo tile floors and 9-inch high shop-made polished terrazzo door trim plinths, base boards and coves set flush with the plaster.

The whole of the operating department and the dressing-rooms will have 6 by 6 inch white flint tile floors and 9-inch terrazzo bases and door trim plinths.

Wards, corridors, and all other bedrooms, similar plinths and baseboards, Portland cement floors, which are to be covered with "battleship" linoleum cemented solidly to the cement.

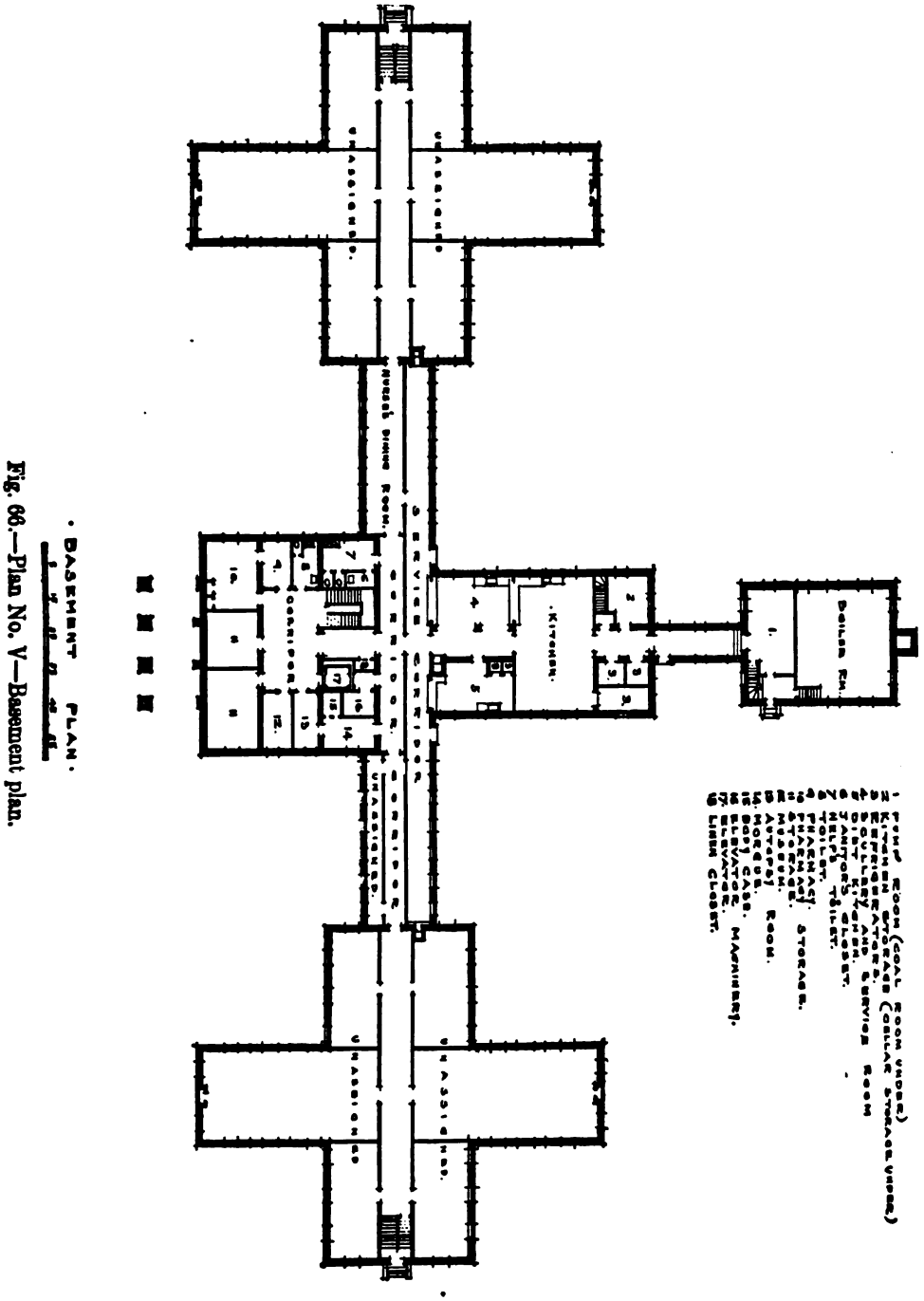


Fig. 66.—Plan No. V—Basement plan.

The central portion with the two sun-porch wings, the power and laundry building, were placed under contract for $165,000. They contain 515,000 cubic feet, at an average price of 32 cents per cubic foot, which includes completing the building ready for use, with the exception of portable furniture, linoleum floor

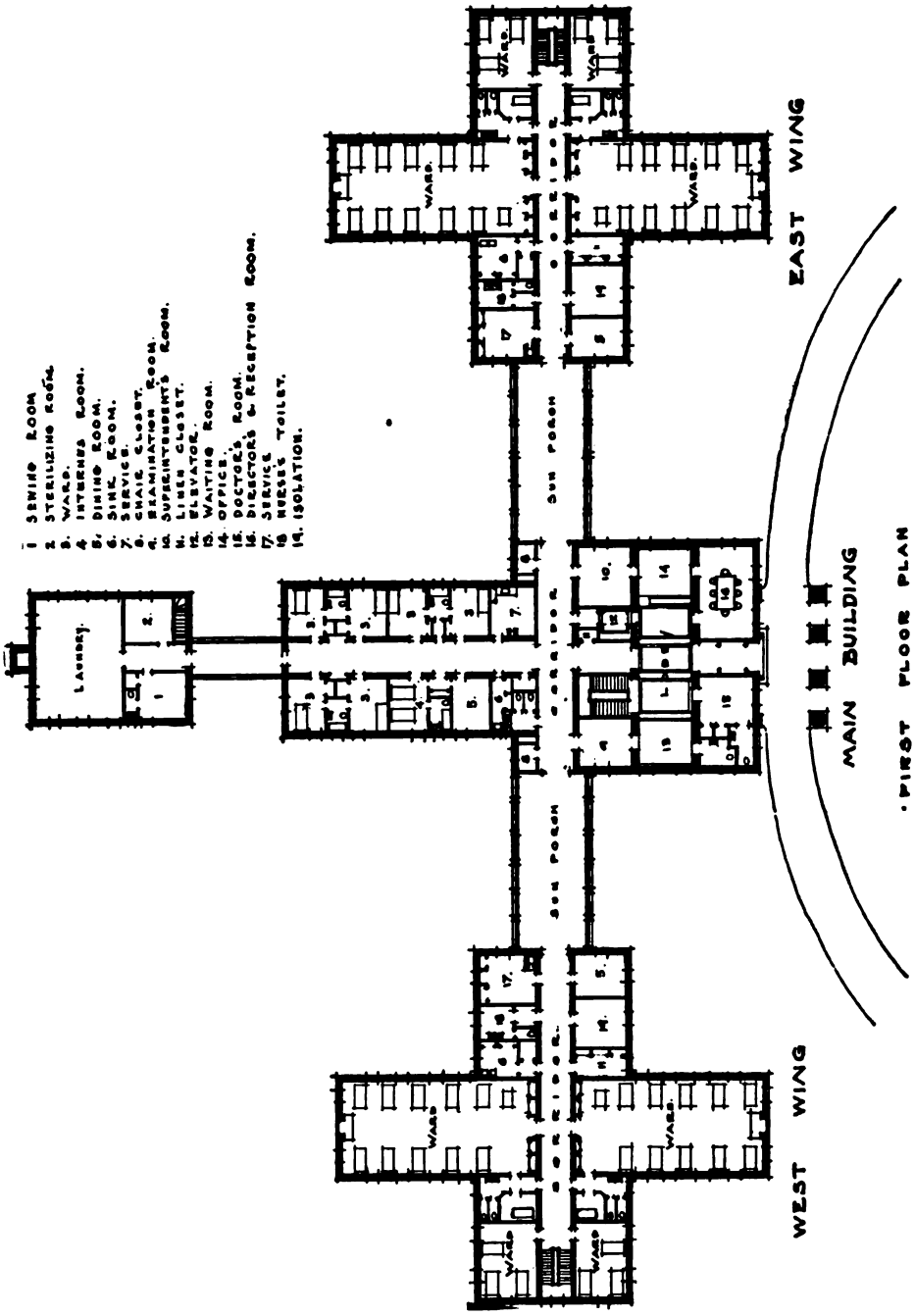
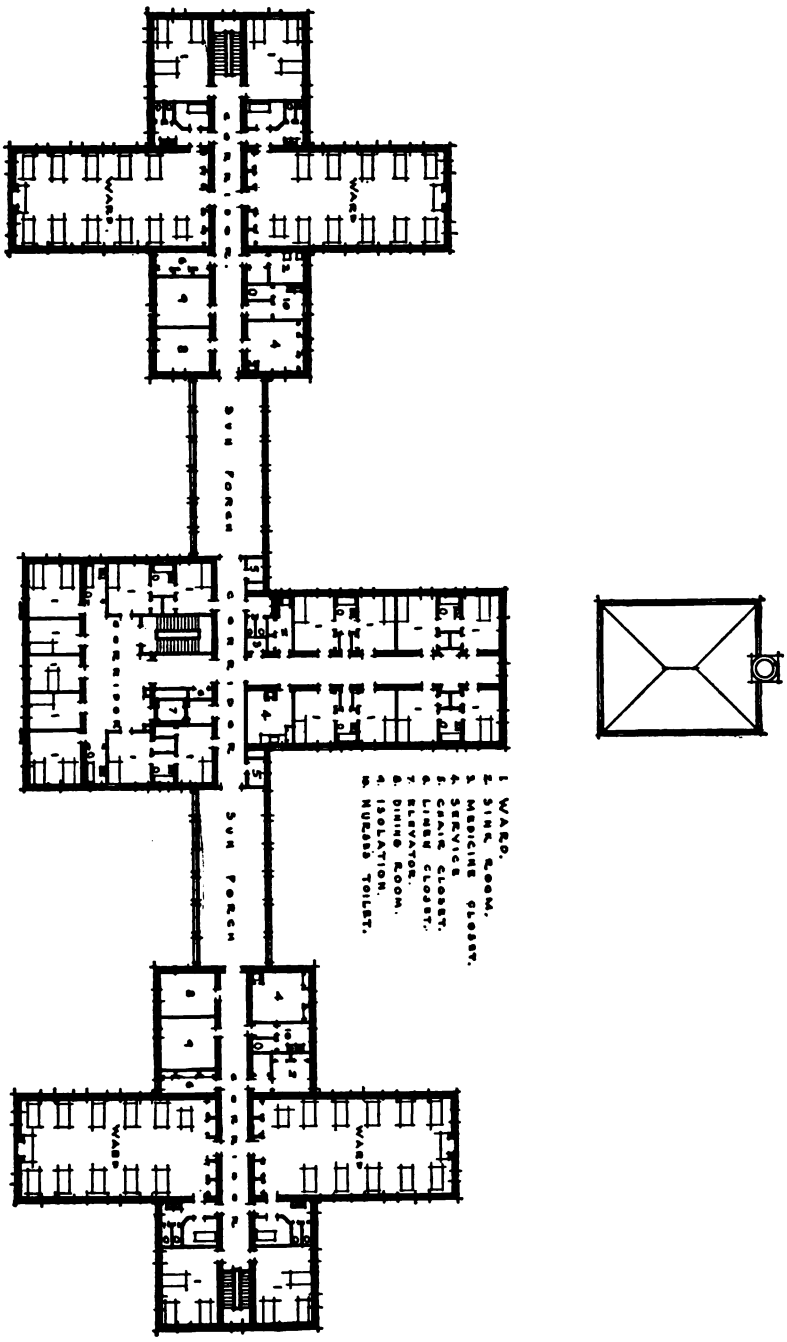


Fig. 67.—Plan No. V—First floor plan.

covering, house furnishings, instruments, driveways, and improvement of the grounds.

Temporarily, the sun porches will be used as 10-bed wards, and the contract sum includes bath and toilet rooms, also emergency stairways in brick towers at each end of the two sun porches; these sun porches are also of fireproof construction.



SECOND FLOOR PLAN.

Fig. 68.—Plan No. V—Second floor plan.

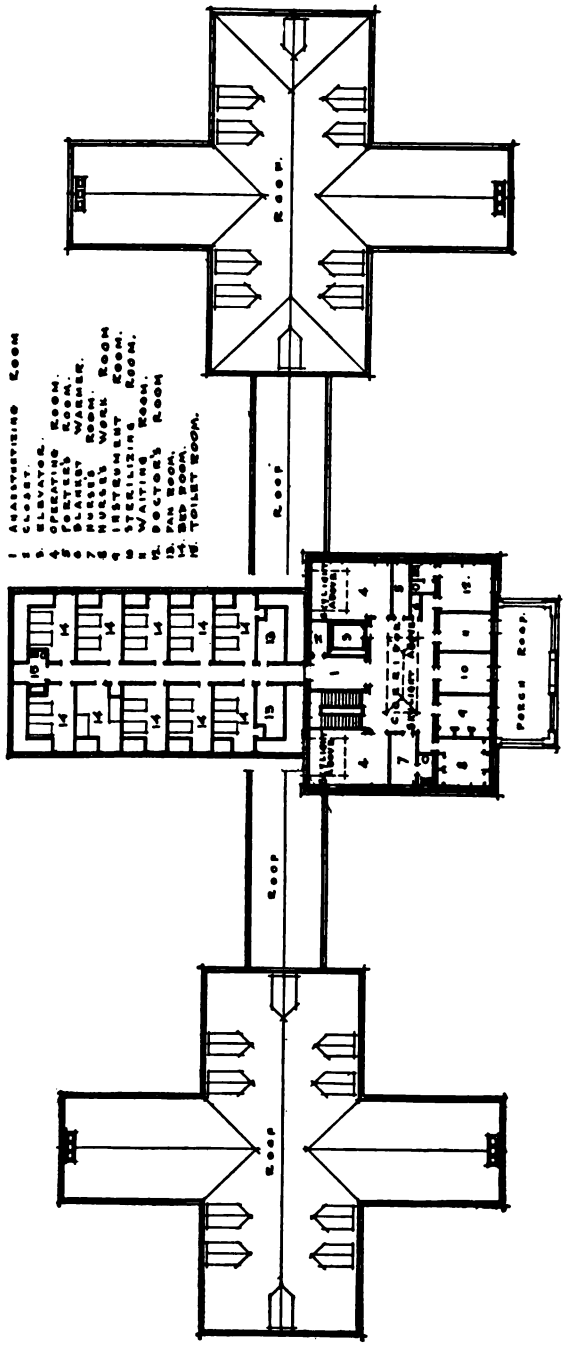


Fig. 69.—Plan No. V—Third floor plan.

The beds in the portion under contract are disposed as follows:

First floor:	Interns	2
	6 one-bed wards	6
	2 ten-bed wards	20
Second floor:	2 two-bed wards	4
	15 one-bed wards	15
	2 ten-bed wards	20
Third floor:	10 two-bed wards	20
Fourth floor:	Dormitories	10
	Total number of beds	97

The two-story cross-shaped wings which are to be erected in the future will increase the capacity by 108, or a total of 205 beds.

The two cross-shaped buildings will require no additional machinery and special equipment, so that their cubic-foot cost will not exceed 26½ cents, which will reduce the average cost of the completed building to 29 cents per cubic foot.

THE COST PER CUBIC FOOT OF SOME OF THE PARTS

The cost of plumbing per cubic foot of a hospital building, where enameled iron fixtures are used, in a large institution will average 2½ cents; in a small one, 3 cents. In large institutions, 3 cents will be sufficient for porcelain and vitreous china fixtures.

These costs are governed by the quantities, so that the cubic-foot cost of plumbing in one hospital built by the writer has been as high as 5 cents.

Low pressure vacuum steam-heating system, including steam for laundry, cooking, and sterilizing, also high pressure boilers, have not fluctuated much above or below 2¼ cents.

The many other items required to build and complete a hospital vary so greatly in quantity, quality, or service requirements, especially in the case of mechanical devices, that the cubic-foot cost is seldom the same in two buildings, and very misleading in estimating the cost of a proposed building.

The total cubic-foot cost of the described building is as follows:

Masonry.
Reinforced concrete—structural tile work.
Plain cement.
Steel and iron work.
Ornamental and light iron work.
Cut stone.
Terra cotta.
Fireproofing.
Sheet metal work and slating.
Composition roofing.
Plastering.
Carpenter work—interior finish.
Cabinets, cases, fixtures, etc.
Painting.
Interior decorative painting and plain wall treatment.
Glass and glazing.
Magnesia composition stair covering.
Marble work.
Vitrified tile floors.

Terrazzo tile floors, plinths, and baseboards.
Weather strips.
Screens.
Hardware.

		Per Cubic Foot.
Cost of all above items	$116,000	or 22½ cents.
Plumbing, drains, and septic tank	16,000	or 3½ "
Boilers, heating, and ventilating	11,000	or approx. 2½ cents.
Electric wiring, signalling systems, and telephones, less than		1 cent.
The remaining items make up the total of		32 cents.

A duplicate electric generating plant would cost	$5500
A six-ton refrigerating and ice-making plant	3500
A refrigerated drinking-water system	1250

The stone columns, carving, and terra-cotta embellishments amount to 1 cent per cubic foot.

As stated, the European publications are of little value in the building of American hospitals. Some of the best material on hospital planning has been published in the architectural periodicals, such as:

Mr. Bertrand E. Taylor's article in the "Brick Builder," 1903 and 1904.
The "Hospital Unit," by Geo. H. M. Rowe, M. D., "Brick Builder," August, 1904.
Illustrations in the "American Architect":
"Brick Builder."
"Architectural Review."
"Architecture."
"International Hospital Record."
"The Planning of Hospitals," Ernest Flagg, "Brick Builder," May and June, 1903.
"The Orientation of Hospital Buildings," William Atkinson, "Brick Builder," July, 1903.
The "Brick Builder," No. 9, vol. xix.
Notes on "Planning Hospitals," Dr. S. S. Goldwater.
Also on the use of an "Elastic Ward in the Construction of Hospitals for Contagious Diseases."
"Planning of Children's Hospitals," Dr. Charles Butler, No. 8, vol. ix, "Brick Builder."

A complete list of these for the past twelve years can be found in the "Quarterly Bulletin of the American Institute of Architects," compiled by Glenn Brown, Secretary, the "Octagon," Washington, D. C., containing an index of literature from the publication of architectural societies and periodicals on architecture in which hospitals have a classification.

The following are valuable contributions to the literature of hospitals:

"A Preliminary Report Concerning the Construction of Hospitals for Children," Chas. P. Emerson, M. D., Baltimore, Md.

"Three Special Clinical Hospitals of the University of Breslau, Germany," Edmund Wheelwright.

"Small Hospitals and Suggestions for Hospital Architecture," A. Worcester and Wm. Atkinson, John Wiley & Sons, 1894.

"Healthy Hospitals," Sir Douglass Galton, Oxford, "The Clarendon Press," 1893.

"Rudolph Virchow Krankenhaus," vol. vi., Neubauten der Stadt, Berlin, Ernest Wasmuth, Berlin, 1907.

"Handbuch der Architektur," Stuttgart, 1903.

"Zeitschrift für Krankenanstalten" (periodical), Leipzig, F. Leineweber.

PART II

EQUIPMENT OF THE HOSPITAL

As the equipment of the hospital includes everything that goes inside the institution after the architect has turned it over to the administration, it will be necessary to adopt a system by which we can discuss items of equipment under general headings.

FIXED FURNISHINGS

Let us begin with the discussion of those things which, while hardly a part of the architecture of the building, are yet permanent fixtures in it. Under the section headings of Architecture we have already discussed the plumbing, refrigeration apparatus, steamfitting, electric lighting, and fixtures. We have not discussed, for instance, the vacuum-cleaning apparatus, dishwashing machinery, sterilizers for ordinary purposes, laundry chutes, linen-counting rooms, blanket warmers, towel driers, mattress sterilizers, and the apparatus for disinfecting and cleaning patients' clothing. We will discuss these under their several headings as briefly and concisely as possible.

Vacuum Cleaners.—At the outset of a discussion of vacuum cleaning, as applied to institution work, it will be profitable to summarize the many forms of cleaning that must be done. Dust must be removed daily from the floors of the institution; this includes scraps of paper, stray threads, and odds and ends of all sorts that will accumulate during the day, both wet and dry. Rugs and carpets must be gone over lightly daily, and at intervals they must be thoroughly cleaned. The furniture of the room must be dusted; this includes tables, chairs, dressers, and whatever upholstered furniture there may be. The window-sills and the cracks about the windows must be cleaned of their dust daily. Walls and ceilings must be cleaned at least periodically. Mattresses and couches must be cleaned occasionally, and the interstices of the radiators must be cleaned. What part of this work will the vacuum cleaner accomplish in the present state of that art?

Let us first see what the vacuum cleaner is, and how it works; briefly, it is an air-tight chamber, at one side of which an electrically operated fan is mounted. When the fan revolves the air in the chamber is withdrawn, leaving the semblance of a vacuum. The pipes.or hose culminating in the halls and on the floors lead to the chamber, and the creation of a vacuum in the chamber causes a suction at the pipe terminals. A specially devised "tool" of one shape or another is attached at the pipe terminal, and, by reason of its shape or construction, picks up the dirt or débris over which it passes, and carries it to the vacuum chamber downstairs. The integrity of the "tool" depends on a more or less tightly closed mouth or lips about the article to be drawn in. Just before reaching the vacuum chamber the dirt must pass over a screen of gauze or loosely woven cloth, and it is caught and held in the screen, to be carted away later on.

There are all sorts of refinements of this grossly described mechanism in the many vacuum cleaners on the market, and the various makers claim virtues for their machines in many directions. It must be seen at a glance that any differences between them must be due, first, to strength of suction in the air chamber; or, second, to differences in the shape of the "tools" employed, that will permit a wider range of usefulness in pulling power.

The vacuum cleaner will remove only the dirt that is perfectly dry and freely movable; it will not remove mud or wet dirt; this means that the dust on the floor can be drawn into the vacuum if the proper tool is employed. The carpets can be well cleaned by the vacuum, including the dirt on the floor underneath them. Mattresses and the couches can be very nicely cleaned if the proper tool is employed. The furniture cannot be cleaned at all by any vacuum system in existence to-day, and is quite certain to be scratched by the metal tools. Some of the dust in the window seats and about the crevices in the walls can be removed by the vacuum. A very small part of the dust adherent to the walls and ceilings about the pictures and about the picture moldings can be removed, but the greatest possible care must be taken, since the vacuum tool will serve only to rub in whatever soot may be present, and the wall will be streaked and look all the worse for its use. In some of the systems of vacuum cleaning there is a double pipe employed, by which air cannot only be drawn out of the room, but forced into the room; especially in the smaller portable machines there is an arrangement for employing both vacuum and air-pressure, one to blow the dust from the radiator interstices, and the other to suck it into the vacuum as it flies through the air. Almost all the loose dirt in the room can be removed by a minimum of labor on the part of a very few people in the institution working a vacuum apparatus, but the loose dirt is only a small part of the cleaning to be done, and it is necessary to go over everything that the vacuum cleaner has already gone over if we are to have a clean room. Of course, there will be less dirt to remove by hand, and, in proportion to the frequency with which we go over the room with the vacuum cleaner, will we have less dirt to contend with everywhere; for instance, it will do very little good to dust a room with a feather duster if we merely drive the dust from one place to another, but it would do a good deal of good if we drove the dust with a feather duster from the furniture and fixtures and walls onto the rugs and floors, and then cleaned it from those places with a vacuum tool.

If one inquires of the great mercantile houses whether or not the vacuum cleaner is a satisfactory device in their own business houses, one will get as many answers as there are kinds of business. For instance, the furniture house will say that the vacuum cleaner is of practically no use because it will not dust furniture, but the department store manager finds that it fills a real place in the house. He will tell you that piles of goods on shelves can be pretty well cleaned by the suction of the vacuum cleaner, and that this can be done without raising more dust to settle on the goods elsewhere. He will tell you, moreover, that vacuum cleaning can be done in the daytime, even when customers are in the house, without any noise or dust, and, if the store is a very large one, there will be a great lighting bill saved, because, when the janitors get to work in department stores at night, the place must be well lighted for several hours, and the lighting of a big store costs a good deal of money. In one department store the manager had made the statement that the vacuum cleaner saves them about $1000 per month in the preservation of goods, in the saving of lighting bills, and in cutting down the number of janitors employed.

A great deal of saving can be accomplished also in the large hotels, especially where they have carpets all over the floors, not only in the rooms, but in the corri-

dors, banquet halls, reception rooms, and parlors. In one such house there are 75,000 yards of carpet to be cleaned, and if the vacuum cleaner did nothing else it would be invaluable here for carpet cleaning.

The same would not be true in a hospital, or in any institution in which the sick or ailing are cared for. There are no carpets on the floors; if there are rugs at all they are small, and easily taken out to some central point to be cleaned. There are no tapestried curtains, few if any pictures on the walls, and little or no upholstered furniture, so that the vacuum cleaning would be confined to the floors and walls and rugs. The rugs could be taken outside somewhere, perhaps to the roof, and that much of the dirt would be thus removed from the room.

So that, after all of the pros and cons are considered, we may sum up the situation by saying that an institution may be kept very much cleaner by the use of the vacuum system, but practically the same amount of cleaning will have to be done by hand in any event, and the janitor service of the institution will cost practically the same as it did before the vacuum was installed, but the house will be kept a good deal cleaner, though at an additional cost—cost of installation of the machine, cost of the power to run it, and cost of extra help to operate it.

These arguments, pretty generally known, have been sufficient to deter the average hospital or institution administrator from installing a vacuum-cleaning system in the past, because the expense of such installation has been great, costing anywhere from $1000 to $3000 or $4000, according to the size and architecture of the building to be installed.

Recently there has been placed on the market a portable vacuum cleaner, the best of the kind perhaps being made by the Duntley Manufacturing Co., a Chicago corporation, and this machine has proved quite satisfactory in homes and apartment houses, and small hotels and some hospitals and similar institutions have either installed them or considered doing so. The principal defect, and one that must settle the matter for the hospital administrator at least, is the prohibitive amount of noise made by the portable motor in operating. In the home or in the hotel this noise is made in the daytime, when occupants are away, and consequently cuts very little figure. In the hospital or institution the noise is intolerable, and cannot be thought of.

Very recently this same company is installing a modification of the portable vacuum cleaner that is simply the portable machine on a very much larger scale, located at some point in the basement, from which noises cannot travel readily, and connected to the floors upstairs by pipe lines capable of being installed at a very moderate expense and run up elevator shafts. This machine costs only $300 or $400, and is large enough to permit two outlets to be worked at a time; a line of pipe can be sent up as high as six stories, at a cost of something less than $50, and it can be tapped on each floor. Such an installation is comparatively economic, and even if it did no more than clean the rugs and pull the dirt from the mattresses, it would pay to employ one or two men at this work; at least one such installation is working satisfactorily.

Blanket Warmers.—Of all the semifixed furnishings of an institution there will hardly be an item that will give more satisfaction than the ordinary laundry drier, built in the wall, for the purpose of warming blankets, or for the occasional drying of wet linens, towels, or dressings. This apparatus is nothing more nor less than a chamber in the wall, about 14 inches wide, 8 feet high, and about 8 feet deep. There is an ordinary steam-coil at the back that must not be attached to the heating apparatus of the house, because blankets should be kept hot winter and summer, and it will, therefore, be necessary to have the coil attached to the power-

house itself, or to the steam-service pressure line that serves the steam tables and sterilizers, or if there is a system of these blanket warmers, the piping will be an

Fig. 70.—Blanket warmer.

easy matter. The warmers should be in the operating suite and off the wards and dressing rooms. They may be built of tile, plastered and white enameled inside (Fig. 70).

STERILIZERS FOR INSTITUTION USE

In discussions of the administrative operations of the general hospital it will be necessary to take up the questions of prevention, disinfection, and isolation as administrative problems, and the methods by which to achieve the best results. At this time we are discussing merely the equipment of the institution, and will, therefore, entertain only the question of the destruction of the pathogenic micro-organisms and the mechanism devised for that purpose.

Every institution, whether it be a general hospital or an asylum, school, academy or hotel, or a ship that sails the seas, must be equipped for the destruction of one or several forms of pathogenic micro-organisms, parasites, or vermin. Today, in the light of what we know about these forms of microscopic life, we have settled down to one of three destroying agents—heat, gases, or chemic solutions.

Chemic solutions and the gases have special applications, and need not now be thought of. To use either of them in a general way no special apparatus is required. The other form of disinfection—namely, heat—requires special equipment, made to accommodate the material to be sterilized. It is not the purpose in this connection to discuss the physics of heat or the physical changes that occur when heat destroys micro-organisms. These discussions have a place in works on physics and in books on engineering. Suffice it for us to recognize certain physical facts that are the result of long experience in the engineering profession; nor are we here to design sterilizers, but to place ourselves in possession of sufficient information concerning their principles and mechanism to enable us to buy the proper sterilizer for the purpose intended.

There are, grossly speaking, four forms of heat sterilization: one contemplates the use of dry heat only; a second employs hot water; a third, moist heat in motion, that is, streaming steam; and a fourth contemplates the employment of steam under pressure in connection with a mechanism to create a vacuum at certain points of the process, with a view to enable the steam to penetrate to all parts of the containing device, and thus destroy all micro-organic life resident there.

There are two fundamental objections to the employment of mere dry heat, no matter at what temperature it may be supplied: the principal objection is that dry heat penetrates such material as woolen and cotton goods and packed hair, such as mattresses, very slowly, and, if it is carried at a temperature sufficient to destroy life when it arrives at the spot, it is also of sufficiently high temperature to destroy most fabrics, especially woolens. Therefore we have practically given over any attempt to sterilize by the use of dry heat alone, and use it instead merely as a drying process, in what we shall hereafter describe as the vacuum system of sterilization. Boiling water has physical disadvantages that limit its use to very special purposes, such as the sterilization of the rougher utensils of the sick room, as bed-pans and urinals.

There are two forms in which steam is employed in sterilization, whether it be as streaming steam or in the vacuum devices, namely, saturated steam and superheated steam. Contrary to the usual understanding, saturated steam need not necessarily be just at the temperature of boiling water, that is, the temperature at which water is changed into steam. It may be of any temperature, but by the term "saturated steam" we mean the initial temperature, and consequently the initial pressure at which steam leaves the water container as it is volatilized. Superheated steam is steam that has left its water reservoir as saturated steam, but whose pressure has secondarily been tremendously increased by further application of heat.

There is no doubt that saturated steam at a given temperature, and hence a given pressure, has a greater power of penetration than superheated steam at the same pressure. In the case of saturated steam, however, there is a greater tendency toward condensation than in superheated steam, and consequently the last process of sterilization in the use of steam—that is, of drying—is rendered more difficult and requires more time; hence the total time employed to sterilize goods and make them again ready for use will be greater if saturated steam is employed than if the steam is superheated. But the fact that superheated steam has a less penetrating power, because of its drier physical condition, is almost or completely offset by the fact that its higher potential temperature is capable of greater and quicker destruction when once it does penetrate, and by the further fact that fabrics can be dried in the container more readily because they are not so wet at any stage of the process.

Some makers of sterilizing apparatus are fond of making diagrams showing the container with a great volume of steam under pressure, occupying all the space excepting an infinitesimal point at the center of the apparatus, and a good deal is made of the fact that this central point, however small it may be, is capable of protecting a sufficient number of micro-organisms to start an entirely new infection of the material in the container almost immediately the heat is removed. Those manufacturers whose apparatus calls for a constant moving volume of steam from one end of the cylinder to another insist that there can be no point, however infinitesimal, that will escape the penetrating of the moving steam, providing there is an opening at some dependent portion of the container to allow all the latent air to escape, and hence to allow all the space in the container to be occupied by the steam.

Those of us who have followed the logic of the makers of the various forms of sterilizing device have merely arrived at a stage of indetermination, and have achieved possibly less knowledge from our reading than if we had merely used our common sense. But those of us who have prosecuted our investigations to the point of actual experiments, using the ordinary materials that we have to sterilize artificially infected with some special form of pathogenic micro-organism, have come to almost a unanimous conclusion that, given a container that will allow of the invasion of a volume of steam, saturated or superheated, if it be under a pressure of, say, 15 to 18 pounds—that is, at a temperature of 250° to 275° F.—and if this steam can be circulated in the container for a sufficient length of time, we can achieve actual practical sterilization in almost any apparatus now offered on the market for sale.

A clear warning must be sounded, in effect, that no apparatus, under any conditions whatsoever, should be accepted on the assumption that it will do what is claimed for it until actual experiments have been made, and those of us who are very particular about our sterilization, especially in the sterilization of operating-room material, are in the habit of periodically and frequently making plants of pathogenic micro-organic cultures, and placing them at the core of a package of material which we know to be difficult of sterilization, and, if those hardy micro-organisms can be wholly destroyed under specially difficult conditions, then we accept that sterilizer and the work we are doing with it as a sufficient sterilization. It is not likely that we shall have anthrax and tetanus or their spores to deal with ordinarily, but no sterilization can be considered efficient unless it is a spore destroyer, for it is those hardy micro-organisms that will occasionally upset all our fine calculations. It is not sufficient that we make these plants and estimate the effect of our sterilization once, at the time of purchase of the apparatus, because a hinge on the sterilizer may loosen, or the seat may dry out, or a leak may occur almost anywhere, in which case the sterilization will not be complete, and our first warning of the fact may be some grave postoperative infection.

THE VARIOUS STERILIZERS

Beginning with the largest sterilizer that we will be called upon to use, we have that huge piece of mechanism usually confined to the basement of the institution, and which we call the mattress sterilizer or disinfector, used not only for the sterilization of mattresses, but for patients' clothing, blankets, rugs, and the like. Then we have the utensil sterilizer, used to sterilize ward utensils, bed-pans, basins, and urinals. There is also the linen sterilizer, a mechanism devised especially for the disinfection or sterilization of the bed-clothing and bedding of infected

patients before they can be sent to the laundry. There is likewise the excreta sterilizer, a mechanism devised to destroy infected stools, urines, and sputa of patients suffering from typhoid fever, tuberculosis, and the exanthemata. Then we have the dressing, instrument, and water sterilizers in the operating department of the hospital. In the diet kitchen we have the autoclave for the steaming and disintegration of foods that go to make up certain special diets, and a similar device has a place in the laboratory of pathology for the purpose of destroying micro-organisms for vaccines and for similar purposes. All these devices are intended to achieve a single result, that is, the destruction of pathogenic micro-organisms, and they are made in different forms to accommodate the materials intended to be sterilized in them. Let us first take the mattress sterilizer.

Mattress Sterilizer.—This mechanism has reached a stage of great usefulness in institution administration. Its primary requirements are that it shall be large enough to contain several mattresses at a time, and yet it must be small enough to be economic in the point of steam usage. It must be strong enough to withstand the necessary steam pressure to bring the temperature up high enough to destroy even the hardiest of the pathogenic micro-organisms. It must be so arranged that infected mattresses, bedding, and patients' clothing can be put into it and sterilized, and then removed without danger of reinfection. This means that the mattress sterilizer must have an entrance door at one end and an exit door at the other, and the entrance door must open into one compartment wholly separated from the compartment into which the exit door opens; the mechanism, moreover, must be simple, so that the ordinary houseman can manipulate its valves without danger of injury either to himself or others or to the apparatus.

Some of these large sterilizers are made with a door smaller than the inside diameter of the vault itself, but it is extremely difficult to get a thick, heavy mattress into it, although, after it is inside, there is plenty of room and to spare; this means that entirely too many cubic feet of steam, under the necessary pressure, will have to be employed to sterilize the material that the doors allow to enter. This is especially true with the cylindric devices; but, even if the door is made the same size as the cylinder itself, the shape of the vault in the cylindric types is not adapted to hold as many mattresses as the cubic area will take care of, and there will be a good deal of unoccupied space. Most institutions have a uniform size of bed throughout, and there will be a uniform size of mattresses. When this is the case it will be easy to select the mattress sterilizer of the right dimensions. For instance, the average hospital will hardly have any mattresses that will be more than 42 inches wide, 8 inches thick, and 78 inches long, so that a sterilizer with inside measurements of 84 inches long, 48 inches high, and 48 inches wide (which is a standard size) will accommodate four mattresses comfortably standing on edge.

In the best institutions now all the clothing of free patients and of those not very clean is sterilized before being bundled for the lockers. If the bundles are put in the sterilizer they are very certain to come out damp, no matter how much care is taken in the drying part of the process, and, when they are called for, on the discharge of the patient, they will be found ruined. If, on the other hand, they are sterilized separately, and thoroughly dried before being bundled, they will keep nicely for an indefinite time. The cylindric sterilizer has no conveniences for hanging clothes inside. The 48 by 48 by 84 inches rectangular sterilizer, on the other hand, has a rack made partly for a "clothes-horse"; if the pieces of clothing are fastened with metal clothes-pins, each bar of the rack will hang all the clothing of one patient, and, as there are eight of these bars, two in each division, the

clothing of eight patients can be sterilized at one time. The rectangular apparatus has usually a formaldehyd-ammonia disinfecting device for clothing that cannot be subjected to wet heat, such as felt hats and shoes, and these articles can be sterilized altogether and without heat.

There are two types of the rectangular mattress sterilizer—one made by the American Sterilizer Co., of Erie, Pa., and the other by the Kensington Engine Co., of New Jersey. There is no doubt about the integrity of the American apparatus as to material and workmanship, and it has given satisfaction wherever used. The Kensington disinfector has perhaps a more convenient and more quickly fastened door mechanism, in the form of a series of toggle bolts, that spin around by a motion of one finger until they are set home. In the American, the door is fastened by a wheel movement similar to that in the dressing sterilizer; it takes longer to fasten

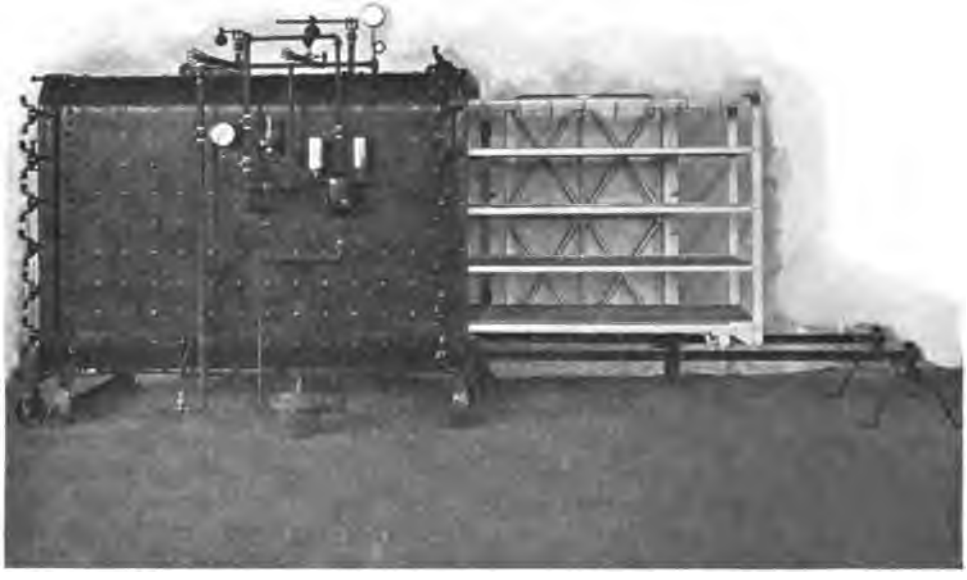


Fig. 71.—"American" rectangular 36-inch wide, 54-inch high, 84-inch long, internal dimensions, steam-pressure disinfector, complete with its regular equipment, including the American vacuum type formaldehyd-ammonia generators with independent steam generator, by which articles of leather, rubber, and other materials that would be injured by steam, can be disinfected by formaldehyd gas let into chamber under a high degree of vacuum without any heat whatsoever in the jacket of disinfector.

the door in the American apparatus. To more than offset the inconvenience, the door carriage of the American is a more substantial and smoother working device.

The door seat is a matter of a good deal of moment. Aside from the packing, the seat is tongue and groove in form, that is, there is a deep groove all around the sterilizer mouth, and opposite this grove in the door is a tongue that sets deep into it. At the bottom of this groove is the packing, which is a secret process material composed of asphaltum and asbestos.

Figure 71 is a photograph of the American Sterilizer Co.'s rectangular mattress and clothing sterilizer. This apparatus may be used without fear of disaster to any who may employ it; it is particularly recommended by Dr. James Duncan Gatewood, instructor in naval hygiene of the United States Naval School at Washington and medical inspector in the United States Navy. Dr. Gatewood went into

this question of disinfection and sterilization most completely in connection with installation of sterilizers for battleships.

Utensil Sterilizers.—Every well-equipped institution should contain a number of utensil sterilizers located wherever utensils are cleaned. There is nothing very particular that need be said about the utensil sterilizer excepting the foot

Fig. 72.—" White Line " utensil sterilizer.

mechanism, which, in most types, is usually out of order. The oil-tank escapement mechanism in some of the types is especially untrustworthy, and, after all, the free floor lift with a notched locking device is best. In some of the newer patterns there is a gasketed seat, which, when operated with a locking lid, makes a steam-tight container, capable of holding at least 5 or 6 pounds of steam, enough to materially shorten the time of sterilization. Perhaps the hydraulic lift will be

best after it has been perfected, but it increases the cost out of proportion to its value.

Figure 72 shows the "White Line" utensil sterilizer, made by the Scanlan Morris Co., of Madison, Wisconsin. This sterilizer is made of heavy copper, the outside of the body and the lid nickel-plated; it is coated inside with block tin, and has the simple foot-lift for raising the cover, and at the same time raising up the metal

Fig. 73.—"American" (patented) hydraulicly operated utensil sterilizer, also method of operating; tray, cover, and contents being elevated by city water pressure acting under hydraulic plungers. Tray, cover, and contents are lowered by pressing the opposite pedal, thus opening water escape valve.

tray containing the utensils. There is a heavy counter-weight attached to the cover hinge that holds the cover up after it is raised by the foot-lift. There are other sterilizers of almost the same pattern, but with a different lifting device and different control, that seem not to be so convenient of operation, as, for instance, that particular mechanism in which the cover and tray are raised by the turn of a valve. This necessitates using the hand, not always a desirable thing to do.

Figure 73 shows the American Sterilizer Co.'s utensil sterilizer. This is also a most excellent mechanism. The cover and tray are raised and lowered by foot pedal, and there is an added simplicity in this device by reason of the few valves to be employed, but the Scanlan Morris mechanism has the greater advantage of the tight water-seal connection between the cover and the container.

Typhoid Stool and Urine Sterilizer.—Figure 74 shows a diagram of a stool sterilizer made by the American Sterilizer Co., the best device of the kind at this time, when all the types are unsatisfactory. It is almost automatic in its operation, the pan being merely set into the machine, caught by a moving arm, upset and emptied, then washed, then sterilized automatically, the process including the total

Fig. 74.—"American" stool sterilizer.

destruction of the micro-organisms in the contents of the pans by the steam that is released into the chamber. This device has not yet reached a very high state of perfection, but heretofore we have had to treat the contents of pans and urinals to a disinfecting solution of carbolic acid or bichlorid for several hours, and, in addition, sterilize the vehicles themselves in the ordinary utensil sterilizer, so that the composite sterilizer is an actual advance.

There are other forms of typhoid stool sterilizers that are quite as unsatisfactory as the one described above. One of these is in use in the Massachusetts General Hospital, another was designed for the Lakeside Hospital, Cleveland. The Hospital Supply Company, of New York, makes one, and one is now under construction by the Scanlan Morris Co., of Madison, Wisconsin.

All, excepting the last named, consist of a cast-iron chamber equipped for a jet of low-pressure steam and hot water.

Dr. Washburn, of the Massachusetts General Hospital, has redesigned his hopper, by giving it a double jacket down to the shut-off valve. The process consists in letting in steam and hot water up to a certain point. Dr. Hurd, of Johns Hopkins Hospital, in attempting to use this hopper found it impossible to keep it from overflowing and making a mess on the floors. He finally dispensed with its services. They are still using it in the Massachusetts General Hospital, although they find it necessary to use in addition a copper tank in which to boil the bed-pan and urinal after emptying the contents into the hopper. Altogether this makes a most cumbersome affair, and requires great attention to details for its successful carrying out. It is made by E. B. Badger & Co., Boston (Fig. 75).

Fig. 75.—Badger typhoid stool sterilizer.

The Scanlan Morris Co. has now in course of construction a high-pressure zinc-jacketed, cast-steel hopper, porcelain lined and porcelain covered. Its working mechanism consists of a high-pressure steam jet, with pressure valve and automatic hot-water shut off. There is a steam pipe leading from the hopper to an exit, either at the roof or into a sewer catch. Into this steam escape pipe is placed a high-pressure cock with automatic shut off, and also a trap for condensation, controlled by a small pet cock at the bottom.

Linen Sterilizers.—Manufacturers of sterilizing apparatus have done their best for a long time to design a mechanism that would act toward loose linen and cotton garments and bedclothing as a dressing sterilizer does toward operating paraphernalia; that is, disinfect it and subsequently dry it, so that it can be handled conveniently into the laundry. They have not been very successful. They have tried three methods: one by dry heat, which has uniformly destroyed the fabrics; one by the simple boiling of the goods in water; and the third, by the use of live steam let loose inside the container. There has been no trouble in disinfecting, but no mechanism offered has as yet succeeded in drying the goods for the laundry. Obviously, any system of disinfection without agitation of the goods, such as we obtain in the laundry washers, will not take the dirt out of the goods, and the two processes are absolutely necessary, either together or separately.

Both the large laundry manufacturers—that is the Troy and the American—make what they call a disinfector, and they claim for it more than they are able to deliver, but perhaps enough to meet the requirements until we can obtain some special mechanism that may be installed or employed in the wards or service rooms of the hospital.

The laundry disinfector is merely a washing machine of small type, made of

metal with gasket seat to the lid and a locking device, supposed to control the machine up to about as high a point as the ordinary dressing sterilizer. As a matter of fact it does not do so.

The obstacles to be overcome in designing a serviceable linen sterilizer are such that there promises to be no relief, except in the form of a vacuum double-jacketed device of some such type as the dressing sterilizer.

Most hospitals are still disinfecting their typhoid linens, and other goods that have been in touch with communicable disease, in vats or tanks of disinfecting solution of carbolic acid or bichlorid, and leaving them there the prescribed time—that is, over night—because it seems to be agreed by pathologists that the micro-organisms of the diseases of childhood, and diphtheria, typhoid fever, and tuberculosis are then completely destroyed in a 3 per cent. carbolic-acid solution or a 1 : 1000 bichlorid solution.

In some hospitals the ordinary utensil sterilizer is employed for sterilizing infected fabrics, the process being a boiling of five or ten minutes, and the goods are then conveyed to the laundry in a wet state. This is a saving of time over the all-night chemic solution process, and, in either event, the goods go to the laundry wet, but the special preference for the boiling process is that we have not to contend with the carbolic acid smell which it is impossible to remove, and bichlorid is rather an expensive disinfector for use in that way.

Operating-room Sterilizers.—Before any sterilizer is set to work in any institution exhaustive tests should be made to determine the definite lethal point of the hardiest varieties of spore-forming pathogenic micro-organisms, and these tests should be repeated at intervals frequent enough so that the surgeons of the institution can be guaranteed the complete sterility of the articles they use in their operations. All the mechanics of steam have not been mastered by physicists, and it so happens that, for some inexplicable reason, a sterilizer that operates perfectly to-day may deteriorate in its usefulness, although the physical reasons may not be apparent; at least that has been the costly experience of some very careful administrators.

Little might be said here of the pro or con of the argument as to vacuum sterilization. The whole purpose of seeking a vacuum in any sterilizer is to be secure the steam is at proper pressure, consequently at proper heat and at proper moisture, and in every part of the container, and so that it shall invade every atom of its contents.

Dressing Sterilizer.—What has been said at the beginning of this section about the purpose of steam sterilization is perhaps more nearly applicable in the case of the dressing sterilizer of the operating department than to any other form of that article. Here, again, it is the case of a vacuum, or no vacuum device, and without doubt almost any of the sterilizers on the market are quite capable of doing the work efficiently under certain well-established conditions, and these conditions can be ascertained only by experiment; it may be stated that there is no type now on the market that can be taken on honor, to be used for any particular purpose, without carefully planned and executed experimentation. For instance, the Bramhall device, in which the door works from the inside and sets upon a seat resisting an outward pressure, is the least likely of all to get out of order, because of the very simplicity of the door mechanism. In this form of sterilizer (Fig. 76) the greater the pressure within the snugger the door will set upon its seat; and it has the additional advantage of being free from danger to the nurse or attendant who should happen to unlock the door before the steam is all out; it would be difficult to unseat a Bramhall door while there is enough pressure inside to seriously burn an attend-

ant, and in this form also there is no question of the wearing out of the hinges or hinge bars of the door, nor is there a question of the wear and tear on the fingers of a locking device such as the other sterilizers contain.

The great objection to the Bramhall sterilizer is that the opening is considerably smaller than the cylinder itself, as, for instance, a 24-inch cylinder will ordinarily have a door of 16 inches, so that when the material is pushed in on the carriage there will be an unnecessarily large space to be occupied by steam pressure, and it may well be conceived that the expense of operating this mechanism on the score of steam alone will amount to considerable in the course of a year. On the other hand, it seems physically impossible to have a door seated like the Bramhall door set into an opening the full size of the cylinder, so that we must accept one or the other horn of the dilemma. Certainly the Bramhall sterilizer is the simplest form of device, and it may be doubted whether one of that make will ever wear out.

Fig. 76.—Bramhall autoclave.

Where the dressing sterilizer is intended to be used as an autoclave, either in the laboratory of pathology or in the diet kitchen, and where the demand is not great, the question of steam is not an overpowering one, and in both these places the Bramhall sterilizer has given perfect satisfaction in institutions where the device has been in constant use. It is true that in neither the laboratory or the diet kitchen is the mechanism so constantly called upon as in the operating- and dressing-rooms. In the laboratory, for instance, the autoclave will hardly be used for more than two or three hours a day, and in the diet kitchen it will perhaps be used a considerably shorter time than this, and not every day. The diet kitchen autoclave is used to disintegrate meat, to free it from its extracts by means of pressure devices, and to break up the myosin and melt out the stearin.

The operating-room sterilizer is ordinarily in use about twelve hours a day, and may be called on to do from fifteen to twenty-four complete sterilizations in the course of that many hours. This means that it must be well built, that its vulnerable parts must be of the highest order of efficiency—such, for instance, as the finger of the interlocking device on the doors and the hinge and hinge rods. In most of the dressing sterilizers in which the doors open outward repairs must be done so frequently that the apparatus is out of use a good part of the time; these doors are heavy, and they are opened and closed frequently, and thus the hinges and hinge rods are subjected to a great deal of wear and tear, to say nothing of their share of the pressure from within. This wear and tear on the doors has the effect

of loosening the seat in most of the sterilizers, which tends to decrease the efficiency by releasing a certain amount of the steam.

In the Michael Reese Hospital a careful test has been made recently of the advantages and disadvantages between the American dressing sterilizer and one of the older types, and it was found that, in addition to the advantages of the safety device and the greater durability of the hinge and bearing parts, the American apparatus has a great advantage in the time employed in bringing it up to the

Fig. 77.—"American" dressing sterilizer, including independent steam generator with automatic control valve and the "American" (patented) three-way control valve, by means of which steam is admitted to chamber, withdrawn from chamber, and vacuum created in chamber at the will of operator.

proper steam pressure. The American sterilizer (Fig. 77), used was 24 inches deep and 22 inches in diameter, inside measurement, and it was found that 250° F. of heat (that is 15 pounds of pressure) could be reached in three minutes, which is about ten times as rapid of operation as the other machine, a very considerable point in a busy operating department. This is due to the independent steam generator. Additional security is offered in the door of this sterilizer by a stop notch in the wheel screw, which releases the door so it gapes a quarter of an inch, sufficient

to allow any unregistered steam to escape sideways, and holding it there for an instant before opening completely (Fig. 78); this saves careless nurses from being burned. In its operation this sterilizer acts like the other so-called vacuum devices, having a steam jacket, an outer and an inner shell, with an opening at the dependent points of the bottom, by which air is forced out of the cylinder as the steam enters under pressure, and mobilized from time to time, so that it will have an opportunity to invade whatever pockets there are.

All the present makes of dressing sterilizers, excepting the Bramhall Dean, are based upon principles laid down in the old Sprague sterilizer of more than twenty years ago, and no improvement whatever has been made since that time, except in the matter of material and finish.

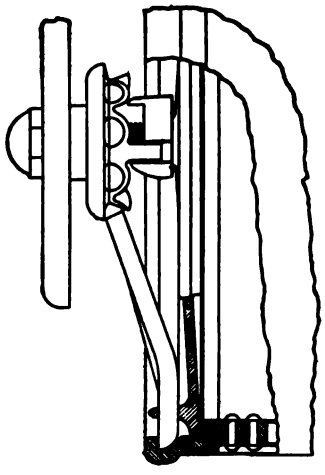


Fig. 78.—Cross-section of "American" dressing sterilizer. Door construction, including packing joint, ball-and-socket arm connection, and improved stop.

The Hospital Supply Co., of New York, is the first manufacturing concern to attempt the design of an entirely new principle in dressing sterilizers —that is, a new design for this country. In Europe, especially in Germany, the cabinet or wall sterilizer has been in use for some years; not a wholly satisfactory use it is true, but along lines that the Hospital Supply Co. seem to think they can make perfectly efficient by certain changes devised in the Michael Reese Hospital for this mechanism. This new cabinet sterilizer is only 18 inches deep, set into the wall or recess, and properly insulated by asbestos composition. The door is copper-lined, with a layer of asbestos composition between the outer and inner plates, so that the radiation of heat is reduced to a minimum. Any number of drums or metal dressing boxes can be placed in the shelves and kept there after sterilization, as in an ordinary cabinet, or sealed and set in the drum racks.

This cabinet has the advantage of the present dressing sterilizer, and yet occupies no much-needed space about the operating-rooms, and has practically no heat radiation. There is a packing of magnesium blocks for non-radiation surrounding the cabinet except on the front or door side.

While we are on the subject of dressing sterilizers, it will not be inappropriate to say a word on the desirability of sterilizing operating clothing, bandages, packs, and sponges in a container that can be subsequently sealed and kept sterile until used. These sterile drums are 12 inches in diameter and 9 or 12 inches high. The lid is fastened with staple and hasp, and can be locked for perfect security. Around both top and bottom of the sterilizer is a broad rim 1 inch in width, with ½-inch holes at intervals of 2 inches, and there are corresponding holes underneath in the body of the drum, which are opened or closed by sliding the bands. Another type contains elliptical holes at intervals all over the sides, with wire-mesh covering, and inner slide device for covering the holes after sterilization. The objection to this form is that the great amount of surface covered in the double jacket permits the whole mechanism to get out of working order if a small dent is made at any point.

After the drums have been packed the holes are opened, and they are closed immediately after the drums are taken from the sterilizer.

Under the head of Operating-room Material, in another part of the book, will be found a list of the packages usually contained in these drums, and, if used properly, the whole device is most satisfactory. There can be a sufficient number of drums to meet any emergencies in the operating-rooms, and the drums can be so packed that they will answer for the usual classic operations.

Water Sterilizers.—Most hospitals have a water-sterilizing attachment to the general power plant, and all the water that runs to the operating- and dressing-rooms is sterilized, and, in most of these plants, the sterilized water has been previously triple filtered, to take out the mechanical dirt.

In connection with one such institution, where the power plant was located at the end of 350 feet of water pipe before it reached the operating-room, repeated tests of the sterilization were made, and, notwithstanding the fact that medical men believe water pipes are liable to bacterial growths, every test showed the water to be sterile. Nevertheless, most surgeons seriously object to the use of such water for the irrigation of wounds and for wringing sponges, as well as for the making up of their solutions, so that additional precautions must be taken, and this must be done by the use of water sterilizers in the operating-rooms.

All the commercial water sterilizers offered on the market to-day are capable of giving practically a perfect sterilization to meet the most exacting requirements for operating- and dressing-rooms. These sterilizers are made up of three parts—a quartz filter, through which the water to be used is passed as it enters the chamber, a jacket containing the live-steam pipes, and the container itself. Up to this point all the sterilizers are practically the same. There is one point, however, well worthy of consideration, and that is the question of the ease with which the water sterilizer can be cleaned. Nearly all these sterilizers are built with the tank and its bottom in one piece, with a top removable by means of bolts. This seems to be an error of construction, since it is practically impossible to keep out every particle of mechanical dirt, even after careful filtration, and this dirt will gravitate to the bottom. In the course of time quite a layer of dirt will lie on the bottom of the sterilizer, and there ought to be a means of reaching the bottom for cleaning purposes. In only one of the sterilizers made is this point covered, and that is in the mechanism offered for sale by the American Sterilizer Co. In this mechanism, as shown in Fig. 79, the sterilizer itself is shown as a one-piece device, excepting for the bottom, which is bolted, making the sterilizer easily accessible for cleaning purposes. The bolts are hidden on the inside of the rim; the top being a part of the shell, it is smooth and easily kept clean on the outside, and, as the whole shell lifts up with a moment's work, the mechanism is easily cleaned of sediment.

The other makers claim that their apparatus is quite as easily cleaned by taking the bolts out of the top lid and lifting out the coils. But the sediment is still at the bottom, and the whole mechanism must be dismantled to get at it.

Recently a new plumbing arrangement has been designed for obtaining hot or cold sterile water from the sterilizers, delivered to the sinks in the operating-rooms by means of piping and faucets. This mechanism contemplates placing the hot- and cold-water sterilizers at the ceiling in the sterilizing room, piping over to the one or more sinks in the operating-room proper, so that hot or cold water can be drawn at the sink just the same as other water. Additional faucets, self-closing in type, must be placed over the sink in addition to those for ordinary washing water. Heretofore sterile water has been carried usually in pitchers, and, more often still, the ordinary water that has come from the power plant, or from the city mains, has been used for the irrigation of wounds, dipping of sponges, and

so on. Most surgeons are no longer satisfied with this slip-shod method, and demand not only sterile water, but demand that it be sterilized in the operating-room suite.

Instrument Sterilizers.—There is almost no point to be made concerning instrument sterilizers for operating-rooms; any metal box, mounted upon legs to give a convenient height, is practical for all purposes of instrument sterilization. The

Fig. 79.—"American" design of water sterilizers with all operating valves (each fitted with name-plate indicating function) and self-contained piping. These reservoirs are also fitted with our new design of quick closing water-gage valves; separating joint for cleaning at bottom, thus giving direct access to the interior and doing away with the unsightly dust-catching joint at top.

instruments are set in a tray and covered with a towel, and the sterilizer is partly filled with hot water and live steam is turned in. This is the simplest form of sterilization, because there are no hiding places for micro-organisms, and uniform wet heat can reach every part of the instruments at all times. The only point about instrument sterilizers is that they must be operated by a foot pedal, since nearly always the nurse who handles the instruments is a clean nurse, and oftentimes

she is gloved for clean work. A mechanism that will raise the tray to the top is desirable, because a nurse working in a hurry will sometimes burn herself lifting a tray out.

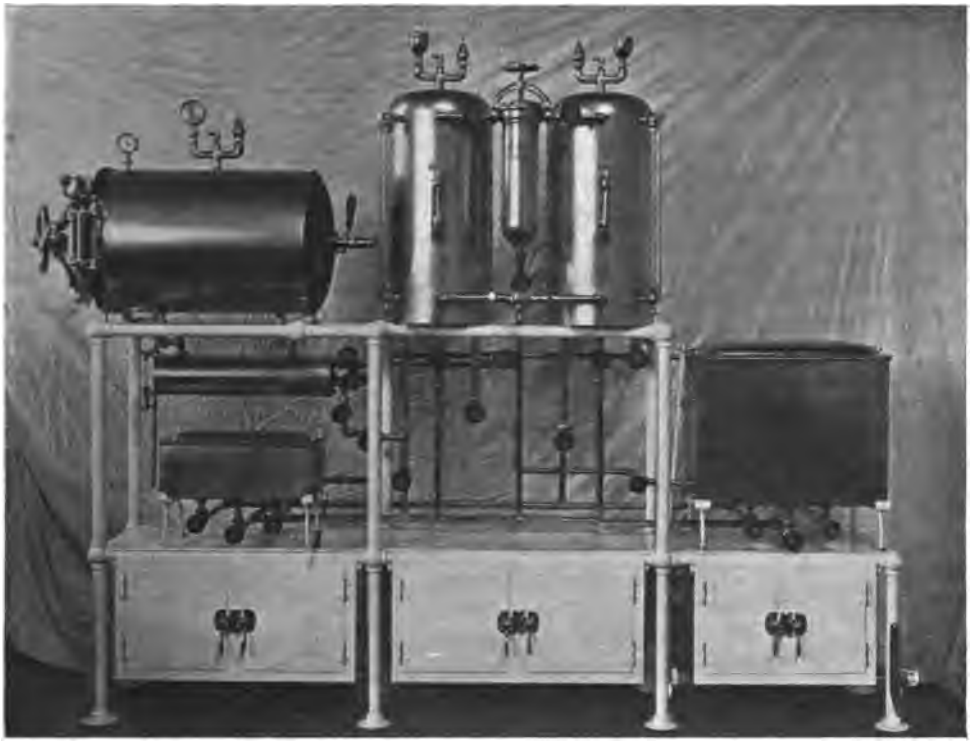


Fig. 80.—"American" special combination sterilizing outfit, consisting of dressing, water and utensil, and instrument sterilizers, together with six water-tight storage lockers, designed expressly for U. S. Navy Department, and installed on battleships "Arkansas" and "Wyoming."

Combination Set.—Figure 80 shows a compact set, made up of all the necessary units—dressing utensil, water, and instrument. This is a most convenient set for small hospitals. It can be had to run by electricity where high-pressure steam is not available, or by a small gas boiler. The set costs about $400.

FURNITURE IN THE HOSPITAL

BEDS and bed fittings, tables of various sorts, chairs, receptacles for clothing, and rugs for the floors—all these are furniture common to all parts of any institution, and it may be just as well to take them up in their regular order in this place.

BEDS

The bed is the most important article of furniture in any sick room, and its composition and dressings are certainly among the most important items in institution administration. Of course, none but metal beds are to be considered. It is to be doubted whether the particular metal makes very much difference, except as a matter of strength. Simplicity is of prime importance, because plain material can be cleaned more readily and will be cleaned oftener than decorated, fretted stuff, and white enamel is the best material to clean, because it shows dirt more readily, and will therefore be cleaned more thoroughly; but, up to the present time, there is no enamel that will not scratch off under ordinary usage, and nothing looks quite so untidy as a badly scratched white bed. White enamel again makes the cheapest of beds, because the manufacturers can use the cheapest forms of iron when they know they are to be covered by a white paint. For the wards of an institution there is no form of bed now made that will take the place of white enamel, but we must resign ourselves to the fact that constant re-enameling must be done.

If users would pay the price for a properly made article, bed makers would be compelled to build their baking ovens large enough to take in bed parts, and take them at a sufficiently high temperature to fuse the enamel into the metal, and there would be no cracking or scratching.

For private rooms brass would be without question the best metal for beds, but for the one fact that at the present time no polish or material of any kind is made that can be used to keep the brass from tarnishing, and, after a year or two of wear, with the spilling of acids and medicines, brass beads are not pretty.

The design of the hospital bed is a question to which very much attention has been given by recent inventors and designers, and there is on every hand an apparent desire to complicate this piece of furniture by the addition of all sorts of alleged conveniences. They are made now so that the feet can be raised and the head lowered, or vice versâ; so that both head and feet can be raised and the buttocks rested in a hollow between the two; some are made to allow patients to sit up in comfort, and some are even made so that they can be tilted sideways, and patients are thus allowed to turn over without any effort on their part. All these efforts are worthy as to their intention, but result in complications of mechanism that get out of order constantly, are veritable dust catchers, and almost require an engineer to operate them.

The better way is to have the bed in the simplest possible form, and pieces of furniture in convenient closets about the ward or floor that may be used for achieving the same purposes intended in these beds. There are so few patients that need the auxiliaries that it seems hardly worth while to furnish a hospital with a lot of

lumbering stuff that has many disadvantages and such semi-occasional usefulness. For instance, there are side rests made of wire, and bound with heavy metal, that are convenient and easily placed either over or under the mattress. There are back rests that are the essence of simplicity in construction, and there are foot props that will serve every purpose to prevent patients from working to the foot of the bed.

The height of the bed is of the utmost importance, not so much in the interest of the patient perhaps as to facilitate easy handling by the nurse, a matter that is of vital importance if patients are to obtain adequate care. The low bed is a back-breaker. The low bed is one that is 22 inches to the top angle iron frame of the mattress. The high bed, approximately 28 inches high to the top of the mattress, will never be found disagreeable to the patient while lying in bed, and will allow the nurse to perform all the necessary duties to the patient without stooping over much. The high bed is, of course, an inconvenience for getting in and out, but patients

Fig. 81.—High bed with nurse's couch half drawn out.

are not getting out and in bed very often, and the act of assisting them in and out will happen infrequently, while the duties of a nurse to a patient lying down are so constant that there seems to be hardly an argument against the high bed.

The high bed is especially advantageous in private rooms, because the nurse's couch can be kept under it when not in use, and oftentimes these couches are most grateful to patients who wish to change for a rest from one bed to another, or to allow their own bed to air. Figure 81 shows a high bed with nurse's couch half drawn out.

Width of Beds.—The width of the bed, especially for the adult, is a matter of a good deal of importance. The patient needs a wide bed, and the nurse is better off if the bed is narrow, but as the patient is of somewhat more importance, and has to use the bed more constantly than the nurse, perhaps we would better consult the patient's comfort rather than that of the nurse in this particular instance; hence, the wider the bed the better off we are. Perhaps a happy medium, taking

into consideration the patient's comfort, the space allowable, and the ease with which the patient may be handled by the nurse, would be 42 inches.

Springs.—The spring of the bed is a matter of very great moment, so far as the patient's comfort is concerned, durability, and economy. Commercially, the bed-spring business is not in very good shape. Figure 82 shows one that is perhaps, for all purposes, the best. It consists of chain and cross-chain lengths, with wire side line from end to end of the bed, and with spirals at each end of every chain. The only part to wear out with this spring is the spiral, especially those toward the center of the bed, and these are sometimes made of double strength, so that the full weight of the patient is compensated by the extra strength of the spring. This spring is not at all likely to give down in the middle, it does not fix itself in a hollow, and gives readily with the movement of the patient from side to side or from head to foot. It is not a costly spring. It can be used in private rooms, private and public wards, in the adults' or childrens' departments, with equal comfort

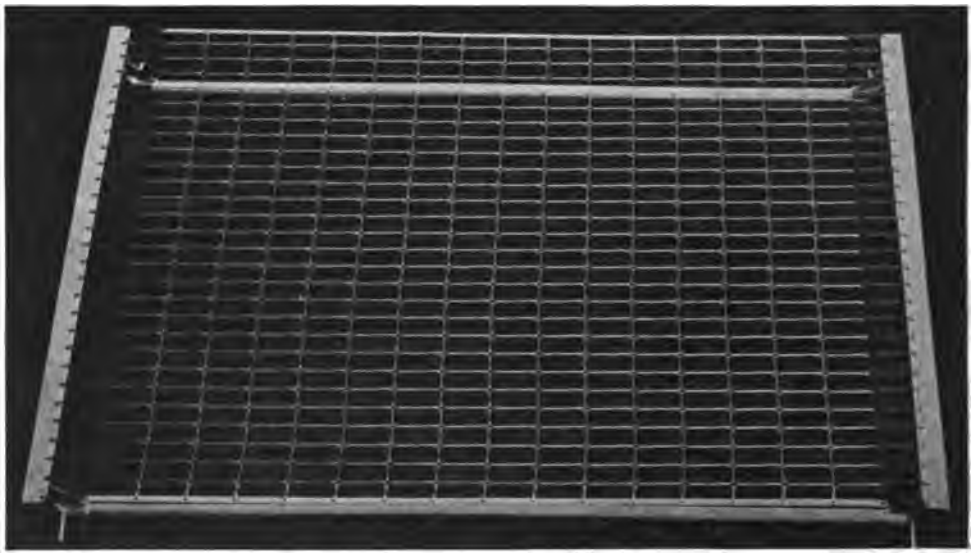


Fig. 82.—Form of bed springs.

and advantage. The old form of spiral spring is out of date, and is not admissible for the purposes of a public institution. It has the habit of wearing down in the middle, by the stretching of the spirals.

There is a disposition on the part of some institution managers to do away entirely with springs, and to use slats lengthwise and crossways, made of metal bands. When this is done there must of course be a very large, thick mattress, and it may be doubted whether any material will retain its springiness sufficiently to compensate for a spring of a different sort so that the patient will be comfortable.

There is a disposition in other quarters to go back to the old box-spring of twenty or thirty years ago. This is entirely out of the question, because the box-spring can never be cleaned, and becomes a breeding ground and hiding place for germs of all sorts, microscopic as well as macroscopic.

Mattresses.—The mattress is perhaps quite as important as the spring, and, so far as the comfort of the patient is concerned, much more important than any of the articles in the furnishing of a room.

Some of them are cotton, some felt, some a mixture of these two, and others of hair of various qualities and of various kinds. It is questionable whether such a mattress as the Ostermoor is the best for a private home, and for well people to sleep on, but the manufacturers of these felt mattresses have not striven very hard to place them in institutions, for the obvious reason that they do not lend themselves to institution requirements. Beside the item of comfort to the patient that of cleanliness is a most important factor, and it is not easy to get blood and the fluid secretions out of a felt mattress. The same would be true of cotton, only in a greater degree, and both of these materials should be ruled out for hospital beds, not only because they are difficult to clean, but because they do not lend themselves well to fumigation and sterilization, on account of the compactness of their texture; and, notwithstanding the slightly greater first cost, there is no material for the hospital mattress that will take the place of curled hair. It is expensive, and will cost for the average mattress $8 to $10, but, because of its porosity, it can be easily fumigated, and under the severest tests the hardiest of the pathogenic micro-organisms can be destroyed if embedded in the middle of a thick curled-hair mattress, under the intense fumigation or sterilization that will be employed in the institution. If the tick is soaked with blood it can be renewed, and the hair washed and sterilized at a total expense of $1 or $1.50. Then, again, curled hair is a versatile mattress in its usefulness; it can be made into pads of any size and thickness and for any purpose, either for adults or infants. Pillows can also be made out of it for leg or arm rests. It does not wear out, and is practically a permanent investment. If desirable, it can be turned out in bulk into the fumigating room and fumigated, or disinfected at any temperature required, even to the point of live steam.

The cheaper grades of hair are not economic because the individual hairs break, and eventually the mattress packs like felt without the latter's springiness; the hair is too short in these cheap grades.

Childrens' Beds.—There are so many points to be considered in the design and use of a child's bed, and so many conditions to meet as to the place in which the bed is to be used, the age of the child for whom it is intended, whether it is a well child or a sick child, that there seems not to have been designed any bed that would meet all the required conditions. First, we must think of the very small infant, only recently born perhaps, whose mother is not yet strong enough to lift the child over a high rail. Then, for this same young baby the bed must be made with bars so close together that the head, or even a limb, cannot get through so as to be hurt in case the child tosses about. Then, there is the older child, just learning to stand while holding on to something, and that will certainly pitch over the top of a rail unless it is higher than the rails of most beds. If we are to have a rail around a child's bed, the catches must be so strong and easily adjustable that there will be no danger of the child pushing the rail over, in the event that the nurse or mother should happen not to latch it securely. There is also the still larger child that rolls about and tosses in bed. These conditions concern the age of the child.

Now, let us take the private home, in which there cannot always be a nursery maid, and where the mother must depend upon some sort of security after it has reached the crawling age, and where it cannot get hurt. We oftentimes see two or three chairs laid down on the floor, and a pen made of them to keep the child from crawling into danger, but nearly always there are openings through the parts of the chair that the baby will crawl through, and perhaps get into the fire or fall downstairs; or perhaps the baby may pull one of these chairs over on itself and be

severely hurt; then there are nearly always rough parts of the chair exposed, so that the baby may fall and be severely injured. But the baby that is old enough to get into this sort of michief will be old enough also to climb over the rail of almost any of the ordinary makes of bed and fall to the floor, so that it seems we need a bed with a rail high enough so that the baby can play in it, and allow the mother to be in another room or downstairs, without any fear of something happening.

We must always think, too, of a rail for the child's bed that can be almost automatically so securely fastened that there will be no danger of a careless nurse or a careless mother leaving it in such shape that the child will push it down.

Then, there is the hospital bed; and this bed, too, must meet a number of requirements, all those that have been suggested above, and others made necessary

Fig. 83.—Child's bed designed by the author—cage lowered.

by the large number of children that a single nurse must sometimes care for, that is, the security must be even greater than in a case of a single child in its own home. The child's bed in the hospital must be of a sufficient size and of proper make so that either a very young baby or a child of considerable size can be accommodated in it. There is the question of space in the ward that must be taken into consideration. The childrens' ward in the hospital is usually made up of rows of beds, with the heads against the wall, and in this modern day it is a prerequisite that every child shall have its own equipment, linens, dishes, dressings, thermometer, and the like, and these may be kept on a small table at the bedside. So we have a large number of varying conditions that confront us when we attempt the selection or design of a child's bed. Take, for instance, the hospital child's bed in which the rail is fastened to each end at the top with a bolt that goes into the

upright, when the bolts are drawn out the rail falls outward and downward. This makes it necessary that we shall have an unoccupied space on each side of the bed equal to the height of the rail, so that the rail will not be impeded when it is swung outward and downward; even if we have a sufficient unoccupied space to allow of the rail being swung downward on either side, we will sometimes have the attending physician and the intern walking up to the bed on one side for the purpose of examining the child, and the nurse will be on the other side, and it will be a very awkward matter for the nurse to lower the rail on the doctor's side without necessitating the doctor's getting out of the way, and time will be required for the nurse to go round on her side and lower her own rail so she can undress the child. The bed with the outward swinging rail, one on each side, is one of three forms of child's bed that can be purchased on the market.

Fig. 84.—Child's bed designed by the author—cage raised.

The second style is one in which the side rails travel straight up and down on an independent rod, with a hook catch at the top of each end that catches on a projecting notch. The objection to this style of bed is that it requires almost no force to spring the rod at one end or the other, so that the rail will bind as it passes up and down; and it is the experience of hospital people that this rod is nearly always so out of order that the rail does not work freely. Another objection to this bed is that the catches oftentimes stick and fail to clasp the projecting notch firmly enough to insure that the rail will not fall. Many accidents have happened to children on account of this rail slipping from its fastening and catching the leg or arm or head of the child.

There is another style of bed not so well known as the two above; this is a fixed

cage fastened to four posts, and the two longitudinal side rails of the bed project considerably beyond the head and beyond the foot. The ends of these two rails are movable pieces fastened with a spring, and on the inside of the two upright posts are notches in which these extensions can be made to catch. The bed is worked by one nurse at each end. The two extensions are pulled toward each other out of the notches, and the bed containing the child is raised or lowered to the desired point, and the extensions are then released so that the bed catches at that height. The objection to this bed is that it must be pulled away from the wall in order to be worked, and that it requires two nurses to work it. It was designed by Dr. Holt for the New York Babies' Hospital.

There is a new form of child's bed, designed by the author, and intended to overcome all of the objections of all the other beds. Figures 83 and 84 show two views of this bed. It consists of four posts, 30 inches high. These posts are held in

Fig. 85.—Nurse's couch.

place by an angle-bar running entirely around the top, and a second one running around the lower part, about 6 inches above the floor. The spring of the bed is stretched across the top bar. The posts are slotted on the inside. The rail of the bed, 26 inches high, extends clear around, and each corner contains a guide runner that works up and down in the slot of the post. This arrangement allows the cage to play up and down the posts. Across the bed in the middle, and just under the spring, is a spring roller, to act precisely as an ordinary window-shade roller. A steel cable runs from each post, to wind around this spring roller, and is fastened to the guide runner on the inside of the post over a small pulley.

This arrangement forms a spring counterweight for the cage, so that one may, with a single finger, raise or lower the cage to any desired height. The spring is so adjusted that the cage will remain where it is placed, whether it be clear down, giving one the impression that the bed is merely an examining table, or at its full

height of 26 inches above the mattress. The balance of the mechanism consists in a screw lock worked from either side, and which, when given half a turn, locks the cage at its desired height.

This bed, though rather complicated in the description, is extremely simple, and no more intricate in its mechanism than the ordinary curtain shade. It can be made quite as cheaply, if not even cheaper than the other child's beds, and it is believed that it will fill a definite place wherever there is a child.

Interns' and Nurses' Beds.—Living accommodations for nurses and interns are usually limited, and there is nothing more comforting to the young people after their work is over than to be able to lounge in their rooms. Usually their quarters are not large enough to afford space for couches, so that the beds must be made to serve for lounging as well as for sleeping purposes, so that it is well to remember two or three things: first, the beds should be low for the comfort of lounging; next, they ought to have strong springs, very much stronger than will be necessary where sick people are to occupy the beds, because these young people oftentimes do some gymnastics on their beds.

Perhaps the nurse's couch shown in Fig. 85 will be best for their rooms. This couch is of iron, strongly and simply made, with a serviceable spring. It is comfortable to sleep on, easily kept clean, and occupies less room than any other bed.

BED RESTS

There are a number of pieces of mechanism designed to give the patient a change of position in bed. The most important of these is the back rest. This is a simple mechanism, as shown in Fig. 86, but a very much-used device in all institutions

Fig. 86.—Simplest form of bed rest.

where there are sick people. It can be raised or lowered by the simple notched arm, as shown in the cut, so that a patient may almost lie down or sit almost straight up. The body of the device is of wire netting, so that, if desired, the patient's back can be exposed to the air, with sheet or light blanket protection, and thus the effects of the hot bed can be ameliorated for the time. It may be doubted whether there is a choice in the several makes of this device. They all serve practically the

same purpose in practically the same way, and as the only opportunity for breakage is in rough handling when being moved from place to place they last a long time.

There is another form of device employed to place the patient on the side. It extends practically from the shoulder to the lower hips, and the patient's body rests in the mechanism as though in a swing. It is often grateful to very helpless patients and to those with bed sores, and, while not nearly so commonly used as the back rest, one or two should be kept in every institution.

Both of these pieces of mechanism will work entirely independent of any necessity to have a specially devised bed, cumbersome and complicated, the spring of which can be made to assume any one of half a dozen positions, either to ease the patient or to meet the requirements of the attending physician or surgeon.

There are, of course, also arm rests and leg rests made with wire-mesh work. These are rather special appliances, and are a matter of taste and special occasion, rather than a part of the ordinary equipment of an institution.

Fig. 87.—Greensfelder's bed-splint.

Fig. 88.—Greensfelder's bed-splint.

Buck's extension is a strictly surgical apparatus, designed by a surgeon to meet special indications in fractures, and need not be more than mentioned, and the same is true of the many modifications of the Buck mechanism. The Hodgen splint for leg fractures, and for injuries to dependant parts of the leg or thigh, is a very old and a very useful splint, unfortunately not very well known to modern surgery. There is a new bed splint for children that seems to justify more than passing mention. Two views of it are shown in Figs. 87 and 88. It was designed by Dr. L. A. Greensfelder for the children's service in the Michael Reese Hospital. Obviously, it is intended for treatment of hip fractures in children, and permits the patient much freedom of movement, either in bed or in a wheel chair.

BED RAISERS

The bed is not a very light article of furniture, and the leverage that must be applied to raise the bed is considerable, especially with the ordinary commercial bed raisers, that must be partly slipped under the bed in half-horizontal position, and then stood upright upon fastenings provided for the purpose.

Another form of this mechanism is represented by Fig. 89. This is set close to the head or foot of the bed, whichever it is designed to raise, and two people are required, one on either side, to raise the bed up to the notches. Usually the people who raise the bed raise it too high and let it drop into place, so that, in the case of either of these devices, there must be a considerable amount of strength to withstand the wear and tear of constant usage. Of course there will be careful people who use them and careless people, and let us give the nurses and orderlies the benefit of the doubt, and say that there will be one hundred careful people who raise the beds to one careless one. But the one careless one will break a hook off, and the mechanism is rendered useless, because, as a rule, separate parts are not made for this mechanism, the design of all those offered on the market being practically the same, and most of them are made to fit any form of bed. In purchasing this device we look for two things—strength and price.

Fig. 89.—Bed raiser.

What seems to be the most practical and efficient bed raiser now offered on the market is made by the Bernstein Co., of Philadelphia. It is simply a large caster, with extension that fits up into the hollow tubing of the bed-post. There is a pin that goes through the tubing and the extension. One nurse raises it up while a second nurse removes the pins and resets them in the new place. Unfortunately, the bed has to be made with a view to this particular form of raiser.

BED ROLLERS

Bed rollers are made to wheel the bed from place to place about the ward, or from one part of the hospital to another. They are used instead of the bed castors proper, because they are fitted with large wheels, rubber or pneumatic tires, and move noiselessly, without jolting the patient and without marking the floor. The rollers are made to fit the ordinary ward beds, and the process of applying them is

to slide the wheels part way under the bed until the bottom rod of the bed catches into the fastenings made for the purpose, and they are then lifted to a vertical position. There is a clamp at the top, on each side of the roller, as shown in Fig. 90, that holds the top round of the bed, and the roller becomes, in effect, a part of the furniture.

Care must be taken in this roller to see that it is designed to fit all the beds in the institution. The top clamps are not made to go high enough to fit some beds, and the bottom clamps often do not reach out far enough to catch the cross-bars of other makes. These rollers are usually made of castings, and one often sees a large number of them broken, especially the hook upon which the bed rests, so that special care must be taken to see that these rest pieces are strong enough. A good many of these makes of bed rollers are fitted with a heavy piece of rubber band on

Fig. 90.—Bed rollers.

the wheels, instead of cushion tires, and when they are new they run very smoothly and noiselessly and do not jar the patient; it does not take them long, however, to dry out, become loose, and they eventually crack and fall off. The mechanism is important and useful enough to justify a better tire than this, and a form of bicycle tire, with grooved rim to the wheel, is not very much more costly than a flat rubber band. Much better than either of these, however, is the pneumatic tire, practically like the automobile tire. The cut shows a flat tire, which is by no means desirable.

Some designs of beds do not lend themselves readily to the ordinary bed roller and bed raiser. Some beds, for instance, are made with a cross-bar between the two head posts, 6 inches or a foot from the floor, and this bar is expected to hold the weight of the bed, even at the extreme Fowler position; this is not a safe way,

however; in brass beds this bar is simply a piece of very thin brass tubing, fastened to the posts by small screws, and it is unsafe to trust the weight of the patient, plus the weight of the bed, to these bars so flimsily fastened. In this sort of bed an entirely different arrangement of a bed raiser and bed roller must be substituted. In some institutions the raiser or roller is made radically different for this reason—the posts of the bed are hollow, and the casters are set into a socket in the bottom of the post. Then when a bed roller or bed raiser is to be used the caster is taken out, and the raiser or roller is pushed into the hollow tube. There is an individual raiser for each post, and there is a stop notch, or several of them, to gauge the height at which the bed is to be held. This is a modification of the Bernstein castor.

TABLES IN THE INSTITUTION

Ornamental Tables.—There must be tables all over the institution—in reception rooms, study halls, libraries, private rooms, and wards, and they ought to be ornamental in design, yet very simple for purposes of cleanliness. Some of them must be of wood, and if they are substantial they will last longer and look better than metal, and give an air of luxury wherever they are. It is the style now to leave ornamental tables free of covering, except perhaps a piece of drapery across the middle, or an ornamental skin thrown with artful carelessness across a part of the table top. Such tables as this can also go into the rooms of the nurses and interns and the well people of the hospital generally; the character of the table, then, depending a good deal on the expenditure possible.

Fig. 91.—Bedside table.

Bedside Table.—Figure 91 shows a bedside table that seems to answer all the requirements. It is easily adjustable as to height, and the table part can be set at any angle. It may be made of any of the woods or of enamel. The top may be made any size required. It may be made with a rim around the edges, so that china or glassware will not slip off, or it may be made with the top entirely plain, so that patients may use it conveniently for writing or playing cards.

Side Tables.—Each room and each ward should be furnished with a side table, one for each patient occupying the room. If it is a private room, something like an air of luxury must be allowed; therefore, these small side tables should be of ornamental wood, harmonizing with the other furnishings of the apartment. They need not be large, perhaps 18 by 20 inches is the best size, with a drawer in

one side, and with a shelf 8 inches above the floor on which to place books and magazines. Patients in private rooms like to cover their tables with friendly fancy goods brought from home.

In the private and public wards it is not possible to observe the same amount of individuality. More patients use the tables, and, for those who are careless of their furniture, it would seem preferable to have white enamel tables, as well as for their durability and ease of cleaning as to preserve the general tidy and cleanly appearance of the wards, because in most institutions the beds and screens, and sometimes the dressers and chiffoniers, are made of white enamel. In these ward tables the material of the top is of some consequence, and this can be either enameled, sheet metal, or porcelain, that seems to be coming into fashion for hospital

Fig. 92.—Table for children's ward.

furniture. Glass is not advisable, not only because it breaks easily, but because things slip about much more readily on glass than even on white enameled stuff.

Childrens' Bedside Tables.—If there must be tables in the childrens' wards they should be very simple, but should have at least two drawers and a lower shelf to contain a drinking glass, mug for milk or other drinks, and whatever nicknacks a child may be allowed to eat from time to time, such as oranges or crackers (Fig. 92). In the first drawer are the dishes, knife, fork, and spoons, cup and saucer, large and small plate, gruel bowl, and perhaps one or two vegetable dishes. In the lower drawer will be the towels and linens for the bed, and for female children of whatever age there should be vulval pads, made of some material cheap enough to be destroyed after one using. They are making now a very handy thermometer case, nickel-plated, with small chain attached, so that the case may be hung to the

bed-post, and these cases should be labeled, one for the mouth and one for the rectum. The objection to them is that the patients play with and break them.

Fig. 93.—Head nurse's table.

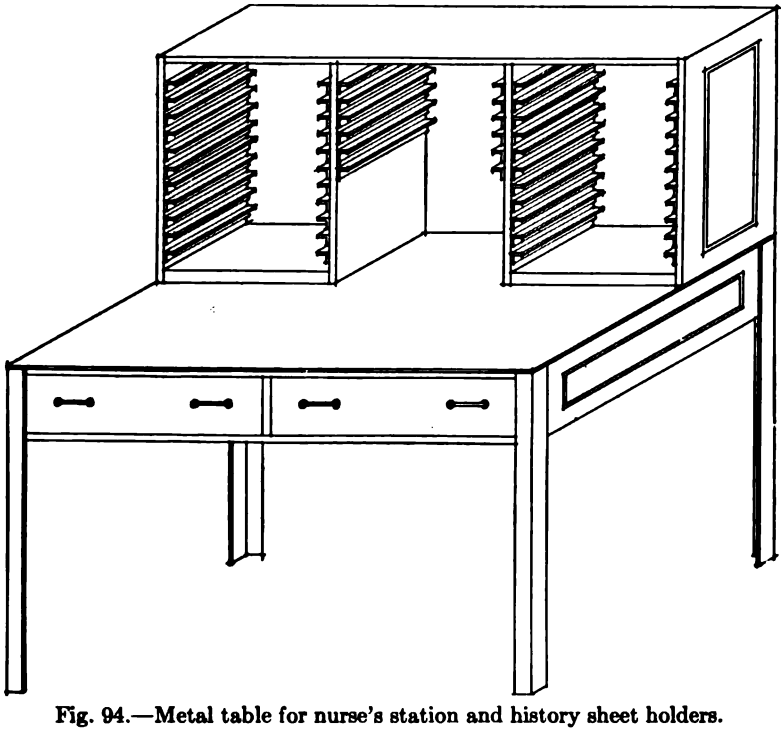


Fig. 94.—Metal table for nurse's station and history sheet holders.

Of course the linens on these individual tables must be changed daily, and they should not be allowed to remain in the ward for any length of time, as there is con-

stant danger of micro-organic infections. This table is employed in the contagious pavilion of the Cook County (Chicago) hospital.

Serving Tables.—The only other tables that seem to be of sufficient importance to demand special consideration are the serving tables in various parts of the house, on which food is kept and from which it is served either to patients, patrons, or employees, and the only detail of this table that is likely to cause annoyance is the material for the top. It is almost certain that linoleum and oil-cloth must be rejected, because they are cut too frequently in the slicing of bread. If it is a figured linoleum it is certain to be scrubbed with sapolio, which will wear it out quickly. The covering of zinc is expensive, and not very pretty or clean looking, and it is difficult to clean a zinc top so that it will not look greasy. If the table has a smooth top of fine-grained wood, and there is very much wear and hard use, it may be treated with laboratory stain, the formula for which will be found under the heading of Equipment for the Laboratory. Grease, acids, alkalis, and the like will not effect this stained top, and, although black in color, it will always look clean.

Head Nurse's Desk.—In some institutions the head nurse's quarters are in the ward itself, and sometimes in a small room off the ward or corridor; the chief article of furniture for the head nurse is to be a table, and on the character of this will depend the system, or want of system, with which the head nurse does her work. Figure 93 shows a head nurse's table that seems to meet the requirements. It is 30 to 36 inches long, 18 inches deep, and with a top 30 inches high. It has three drawers, with a shelf above the top drawer and just under the table top, in which the record books may be kept. The three drawers may be broken into compartments if desirable, so that the nurse can keep things well separated. This table is of white enameled metal ware with glass top. It might have a white enameled top and be quite as useful and ornamental. It should by all means be fitted with rubber tips on the feet. On top of the table or over it, toggle bolted to the wall, the records may be kept in an article of furniture indicated in Fig. 94.

CHAIRS IN THE INSTITUTION

There is probably more irresponsibility in a hospital than in almost any other occupied building. In a hotel certain servants are detailed to clean certain rooms, and certain dining-rooms and parlors, and if furniture is broken the culprit can be easily found. In a hospital, however, there may be a dozen or twenty different people doing things in a single room or ward in the course of a day—orderlies, nurses, maids, floor men, and interns, besides the patient and his friends—and it is almost impossible to fix responsibility for the breakage of furniture, and there is more wear and tear on the chairs than any other of the furnishings. People insist on sitting on the arms or back, or tilted back with two feet off the floor, and it is probably impossible to build a chair that will not break if a heavy man tilts back in it and twists it about; the prime consideration, therefore, in the chairs of an institution is strength, and this must be had without very much reference to the primary expenditure. A good chair may cost $6, and last six years, whereas a poor chair will probably cost $4, or in that proportion, and break before the year is over. So that in the ordinary chairs distributed about the various parts of a public or semipublic institution we must have strength, and we must have rubber tips on the four feet and a rubber tip on the back of the top rail, so that the chairs, if leaned against the wall, will not scratch the paint. There should be one exception in the matter of tips for the feet, and that is in the dining-rooms; the noise incident to the rising of a dining-room full of nurses is almost unbearable, but rubber tips

will not allow the chairs to slide backward and forward and the effect is most awkward. A felt tip instead of rubber is far preferable in the dining-room, and if the floor is hard wood, oiled or waxed, metal tips may be used; they make some noise, not nearly so much, however, as the unshod feet of the chairs.

Rockers.—Rocking-chairs must be considered a luxury in any institution, but they are extremely comfortable, and in many places necessary. A convalescent patient will easily tire if compelled to sit bolt upright or at any particular incline, and he will want to change his position from time to time. He can do this, of course, by a give-and-take mechanism, such as we have in the Morris chair, but it is very much easier to lean forward just a little on the rocker or backward. There is a mistaken idea that the back of a rocking-chair for a convalescent patient should lean far back. This is not according to the best comfort of the patient. A very few degrees backward from the severely vertical position is very much better, and, if the patient wants to lean far backward, he can rest his feet on a stool or hassock or another chair, and obtain almost a reclining position if desired. The rocking-chair should have broad arms, low enough so that the elbows of the patient can rest easily without pushing the shoulders upward. If the arms are broad enough to hold a writing pad, the patient will be able to adjust his arms so that they will rest easily and not be strained.

Metal is not the best material out of which to make rockers. In the first place it is cold to the touch, and if the joints give even ever so little the play allowed will soon develop into a loose joint, and the next step will be a break. In other words, the metal chair is too rigid, and will break before it will give ever so slightly. The best material is good, strong, well-seasoned oak, or preferably, if it can be had, hickory. The rocker need not be very long and sweeping. Very few patients will want to or should rock hard, but a very little vibratory movement in the act of rocking to and fro will oftentimes be of great comfort to a nervous patient and serve to quiet him. This is perhaps more true of women than men, and very much truer of Southern people than of Northern people, because in the South nearly everyone uses a rocker.

The rocker for nursing mothers and wet nurses, and to be used by the nurses in the maternity hospital, should be very low and narrow and without arms. It can be cane-seated or cushioned, preferably the former, for sanitary reasons, and painted or enameled to conform to the other furniture in the nursery.

Morris Chairs.—The only objection to the Morris-chair principle is the upholstery, and, as usually made, it is not very sanitary for that reason, and can hardly be made so. If the cover is of leather, it cannot be fumigated, and can never be sterilized, and sometimes this will be required. The best way is to have the seat in one simple piece and the back in another, and to have these upholstered pieces covered with some plain, strong material, such as denim. In any case, the upholstered seat and back of the Morris chair ought to be enveloped in a washable linen fabric.

There is a new Morris chair with a mechanism that permits the back to be brought forward or lowered into complete reclining position by means of a thumb push at the side of the seat of the chair, just under the arm. This mechanism is easy to work, is very simple, and hence does not get out of order, and the lock mechanism of it is perfect enough to prevent slipping. It is shown in Fig. 95.

Ward Chairs.—In a great many institutions there is a desire, amounting almost to an obsession, to have everything in the ward pure white, and this has led manufacturers to attempt to make an easy chair of white enamel for the ward patients. Figure 96 shows one of these ward, so-called, easy chairs. It is reproduced here as a

warning rather than for any recommendation. Generally this chair is made large so that it can be lined with pillows, and is so high when a pillow is in the seat that the average patient will not be able to touch the floor with his feet; and, with this pillow idea still in his head, the manufacturer has made the chair so deep from front to back that, even with one or two pillows at his back, the patient will still cut his legs behind the knees on the front edge of the seat. The mechanism to raise or lower the back is made very rigid, and consequently hard to work, and the patient will not be able to work it alone.

If this chair was very much smaller and lower, and much more nearly on the pattern of the average rocker, it might be of service in the ward, chiefly because it would be sanitary; and if it was made to conform to the bends of the body it would

Fig. 95.—Morris chair with push-button mechanism.

give a good deal of comfort, but there is no enameled chair made of metal that meets these requirements.

For military camps, field hospitals, and tuberculosis shack colonies a most comfortable invalid chair can be made out of a barrel cut half-way down on one side, and a piece of heavy canvas tacked across; or with a common saw buck, with a back made of two uprights and a cross-piece nailed to one side; two arms can be made by nailing common boards across the forks and canvas tacked from the top of the back to the round coupling; a foot stool completes as comfortable a lounging chair as money will buy.

Wheel Chairs.—In one institution that has distributed about the house something more than fifty wheel chairs of supposedly the best and strongest make, there is an average of six chairs daily in the repair shop, and it has become the custom in this institution for the repair man to make his morning rounds for broken chairs.

All these chairs are comparatively new, and all of them are of the most expensive make of wheel chair. These facts are cited merely to show that the wheel-chair industry is not on a very efficient basis.

Figure 97 shows perhaps the best all-round wheel chair for institution purposes now on the market. It is made by the Gendron Co., of Toledo, Ohio. There are a number of weak spots in this chair; the extension that slips under the seat of the chair to hold the leg-piece in position usually breaks easily; the hand rail attached to the wheel breaks easily or, rather, comes loose from the wheel; the foot-

Fig. 96.—Morris chair of white enamel.

piece on the leg extension is weak. These weaknesses do not develop in ordinary use; in fact, with ordinary care, any of the wheel chairs will last indefinitely, and for the private use of the individual in his own home will do nicely and last a long time, but in institution work they do not get ordinary care. Oftentimes the nurse is not strong enough to effectively help the patient into the chair or out, and hence she raises the back wheel of the chair so that the foot-piece touches the ground, and then she has the patient stand upon this foot-piece and she bears down on the back part of the chair, throwing both her weight and that of the patient on the mechanism. If this method of handling the patient is common to the nurse, it is very

much commoner in the case of the orderly, who is notoriously careless anyway, and even still more common in the case of the patient's friends, who, not satisfied with balancing the patient against the leg mechanism, oftentimes sit upon that mechanism themselves while both the patient's legs are perhaps resting on one side, or they sit on the arm of the chair and catch their heels in the hand rail. However, there seems to be no cure for these inherent weaknesses in even the best wheel chair made, and we shall have to get along with what we have until some enterprising manufacturer can accomplish the apparently impossible feat of making an indestructible wheel chair, or perhaps there might be a hint to some erstwhile bicycle maker, whose legitimate business has gone automobileward, and he may make for us a tubing or metal wheel chair at a price that institutions can afford to pay.

Fig. 97.—Wheel chair.

If there are steps to be negotiated by the wheel chairs in the institution in getting in and out of doors, the chair with the single small rear wheel will not serve the purpose, because the chair cannot be balanced on the single wheel after the fashion employed with baby carriages, and two rear wheels will be necessary.

Commode Chair.—A very essential piece of furniture, and one that must be kept at convenient intervals all over any institution where there are sick people, is shown in Fig. 98. This is at best not a very ornamental piece of furniture, but the one in the cut is perhaps the least suggestive of its vulgar use. The legs of this chair should be shorter than those usually furnished by the manufacturers. There is a receptacle under the seat for the chamber vessel, and if the vessel does not fit tight up against the hole, it should be made to do so with a block of wood, otherwise urine will find its way out of the vessel, and sometimes onto the floor. If

the seat of the chair is low enough there can be a properly shaped cushion of some sort for seat and back, to be used when the chair is acting merely as an ordinary piece of furniture and its necessary but homely office need not be suspected.

Figure 99 shows another and improved form of commode adaptable as a piece of private-room furniture; it may be used as a jardiniere or stool. It is of white porcelain, double-hinged, so that the one pair of hinges operate the outer lid as well as the inner. It has knob feet for sliding over either bare floors or carpet. This is made by the Scanlan Morris Co., of Madison, Wisconsin.

These same people also make another very useful article, shown in Fig. 101, and which they call the white line cabaret commode. There are hangers inside for bed-pan, slop-bowl, male and female urinals. It opens on three sides and is consequently easily cleaned.

Fig. 98.—Commode chair.

Chairs for Insane Persons.—It often becomes necessary, especially in hospitals for the care of the insane, to get patients out of bed against their inclinations. They have perhaps been shackled, and compelled to remain for a long period of time in a more or less cramped position. For the best good of these unfortunate people they ought to be sat up frequently, but, unless they can afford the luxury of a constant attendant, it will be necessary to find some sort of chair in which they can be controlled as to arms and legs and body. There is a chair made for the purpose that has very broad and heavy feet, so that the patient who happens to be shackled cannot toss about and throw the chair over and injure himself. This chair is provided with rings in the back part of both sides, and there is a strap that can be snapped into the rings, and it will hold firmly across the upper parts of the patient's thighs in the bend of the body. There are other rings part way up the

Fig. 99.—White Line sanitary commode.

Fig. 100.—White Line sanitary commode.

Fig. 101.—White Line cabaret.

back of the chair, out of the patient's reach, and a strap with snap buckle fastens across the chest of the patient, about the height of the diaphragm. There are leg and foot extensions either in one piece or two, and there are strap arrangements at the back of each extension about the height of the knee, so that straps can be fastened about the lower leg. If possible it is always advisable to leave the patient's hands and arms free, at least below the elbows. Sometimes this cannot be, as they get the straps off the rest of the body, hence there are rings in the under part of the arms of the chair, and there are elbow pieces made of padded leather into which the elbow fits snugly, with a padded strap in the bend of the elbow, and these elbow shackles are snapped to the rings through holes in the chair-arm. If the patient cannot be allowed even wrist movement for comfort, the horizontal piece of the elbow shackel extends to the end and fastens about the wrist with a strap.

A chair like this can be easily made out of metal to meet the particular requirements of any case that promises to extend over a long period of time, or it can be bought of most of the hospital-supply manufacturers.

RUGS

Well people in the hospital—nurses, interns, and administrative officers—have the right to be as comfortable as possible, therefore they will most always have pictures on their walls, draperies in the windows, and rugs on the floors; these rugs can sometimes be made large enough to practically fit the room, and they can be cleaned with a vacuum cleaner, or rolled up and cleaned out of doors when necessary. Rugs in private rooms are concessions to luxury and are unsanitary at best; they should be vacuum-cleaned every day, and sterilized throughly whenever a patient leaves the apartment as a part of the general cleaning; therefore, they cannot be very large, say 3 by 6 feet; such rugs can be taken up when the bed has to be moved, and they are small enough so that one or two bed-posts will not have to stand on them, which is objectionable.

Private Ward Rugs.—The private wards of a hospital can be made much more comfortable looking and cozy if they have one large or several small rugs on the floor, and, since it is highly necessary to maintain the utmost cleanliness and sanitation in these wards, a hard, bright-colored porous rug will answer the purpose better than a Wilton or Brussels, and there is such a rug made of Southern grasses, very economic in price, very easily cleaned or scrubbed, and capable of fumigation or steaming. It is sometimes known as the Crex, but about the same thing is sold under different names in most furniture and carpet houses. These rugs cost about $7 for a 9 by 12 feet, or $1 for a 3 by 6 feet. They do not wear very well on a much-used floor or in the larger sizes.

It will not be possible to include rugs among the furnishings of a public ward; first, because these wards are very much larger, and next, because it is impossible to control the class of patients occupying them and the friends who visit them.

SCREENS

Bed Screens in Wards.—The screen to shield patients during the bed-bathing or dressing or examination is a rather important item. There are many such screens sold on the market, and none of them is acceptable; usually they are frail. If they are of metal they are too heavy to be moved readily, especially when the material is of heavy cloth or canvas, and where they have castors the castors are usually out of order. If they are made of wood and are light, the slightest push

knocks them over, and the paint soon is worked off by cleaning, and they are not very sanitary.

Generally speaking, these screens have hinges that are difficult to clean, and they are either left uncleaned or require very much time of the nurses to keep them in order. Figure 102 shows one kind of screen that answers a certain demand; it cannot be used for private rooms, as it is too large and heavy.

Some institutions are equipped with screens about each bed; a cable is stretched on standards about 5 feet high, one at each post; there is a width of light canvas or heavy sheeting for each side and each end; the screens can be pulled back when not in use and fastened to the standards. This kind of screen adds greatly to the laundry if they are kept clean, and if not kept clean they are a menace to patients

Fig. 102.—Bed screen for use in wards.

on the score of sepsis. At any rate, they should not be used except when absolutely necessary, because they interfere very much with the circulation of air.

There is another screen, made of two metal standards, 3, 4, or 6 feet apart, each one supported on widespread legs. The cloth is stretched across; one side of the bed can be shut off by such a screen, and its greatest disadvantage is that the legs are always in the way and it is constantly getting kicked over.

Private Room Screens.—The three part, straight-sided, ordinary house screen, made of wood to match the furniture, with screen material of some pretty-figured wash stuff, probably answers all the requirements of private rooms.

Door Screens.—Every door to a private room or private ward of a hospital—indeed, every door of every room intended for the privacy of individuals—should have some sort of protective device that can be made to take the place of a door, that will at once give the occupant of the room the air and light from the outside

and protect him from the gaze of passers by. Figure 103 shows such a screen, one which may be well accepted as suitable for any place where such a device is needed. The frame is made of wood to correspond with the door. Simple detachable brass rods are placed across the upper and lower margins of each opening, so that hemstitched linen or dimity or cheese-cloth fabrics, with a double hem, can be stretched across the openings. These fabrics may be changed whenever desired. These screens wherever used give such complete privacy to occupants of rooms, and allow such free circulation of light and air, that it seems almost impossible to do without

Fig. 103.—Door screen.

them after they have been once used. They at once protect the privacy of the patient and admit the friendly sounds of life and bustle on the outside, so grateful to convalescents.

THE PORTABLE BATH

There is no unanimity of opinion that the portable bath is a necessary or even useful piece of institution mechanism. In some hospitals, notably the Johns Hopkins, it is used regularly and in a routine way in the wards. In some of the insane hospitals it is employed for the long-continued, or even the continuous, bath for unruly, violent, or nervous patients; some dermatologists employ it for continuous

bath in pemphigus, and a few surgeons like it for continuous bath for bad burns. There are objections to the portable bath.

Generally, quite exact temperatures are ordered for patients where a portable bath is required, and generally, also, the bath is expected to cover long periods of time. It usually happens that there is no running water in the immediate neighborhood that can be conveniently used, and it almost always happens that the outlet of the bath-tub cannot be made to reach a check or sewer opening; therefore, the temperature must be raised or lowered by means of the bucket or vessel, and, unless extreme care is taken, the patient is often badly burned with hot water or chilled with cold.

In order to reach its highest perfection in any of the cases referred to there should be hot and cold water for continuous intake, and a sewer outlet, leading directly from the bath outlet, in order that the water may be continuously changed and a correct temperature kept. Most of these portable wheel baths have a suspension bed inside, upon which the patients may be lowered or raised at will, and there are a few cases of one sort or another where they serve a most excellent purpose, but in the vast majority of cases where a portable bath would serve the purpose a permanent tub would do quite as well.

It is not certain that the tubbing of typhoids and other high-fever cases cannot ordinarily best be done in the stationary baths about the wards, and in a number of excellent institutions that have the wheel baths, the Burr baths, Kelly pads, and rubber sheets for the bathing of patients in their own beds the stationary bath in the regular bath-room is usually employed; this for a number of reasons. First, the tubbing of patients is usually a sloppy, noisy, fussy procedure, and, having to be repeated at frequent intervals, it interferes very much with the comfort and quiet of other patients if it is done in the ward. Then it slops the floors very much and often the beds are wet, and the whole procedure is a sort of makeshift that is not the case where a patient is gently lifted to a stretcher or cart and taken to the permanent bath-room. Moreover, the continuous bath for pemphigus is losing favor with most dermatologists, and surgeons generally have gone back to the dry powder or to the open-air treatment of burns. In one institution, where the portable bath is strongly advocated and frequently used, there is the apparently incongruous condition of a separate room fitted up for it, with taps for hot and cold water to run in at the head, and with an outlet situated conveniently at the foot, so that new water can be continuously run in at one end while the used water runs out at the other. It would be interesting to learn just wherein the portable feature is advantageous under such circumstances, since the patient must be brought to this room quite the same as though the tub were an ordinary one fixed in the floor; the raising and lowering device has no special advantage, as the water can be accommodated to the patient quite as easily as the patient can be raised or lowered to fit the height of the water.

DECORATION IN INSTITUTIONS

The furnishing of private rooms of a hospital, or similar institution requiring a particularly high order of sanitation, is not a very simple matter, and the simpler the furnishing the more difficult does the problem become, because of the necessity to preserve appearances. This is not quite so true regarding the furnishing of private wards, because the straining for effect and the necessity for "coziness" are not so great. For instance, the question of rugs and draperies, curtains, couches, and other furniture is a matter of a good deal of importance. A bare room looks

uninviting, while draperies and table covers take away from the room much of that coldness and unhospitality felt by most sick people. Yet these articles of furniture are dirt catchers and vermin containers, and if the rugs and draperies are not cleaned frequently, the appearance of the room is worse than one furnished in the greatest simplicity, besides being positively dangerous. It costs a good deal to launder linen curtains and dresser covers and couch covers, yet this must be done very frequently if the room is to make a presentable appearance.

Medical literature is interspersed freely with arguments for and against pictures on the walls of the sick room, the presence of books, and the circulation of magazines, and there is now almost a concensus of opinion that books may not be circulated or kept in sick rooms—that they cannot be fumigated efficiently—and most members of the profession object strenuously to pictures on the walls. It may be questioned whether a good deal of this protest against adequate furniture in a sick room is not straining at the small things; it is quite certain that the mental restfulness of a well-furnished room will oftentimes add greatly to the comfort and well being of the patient, and more than compensate for any harm that can come, especially if due diligence is employed to keep things clean and sanitary, but perhaps there is a happy medium that will permit of proper rugs on floors and lace draperies in the windows, with perhaps decorations of cheneille or similar stuff with linen covers in figures on the dressers or tables. This arrangement must always be presaged, however, by the understanding that these rooms are to be well kept, that the linens are to be changed at least often enough to prevent their use by more than one patient, and there is nothing more cold or disagreeable and discomforting than a bare floor, and in these days, when vacuum cleaners can be had that do good work with rugs, and when every room is supposed to be well fumigated with an effective germ destroyer, there would seem to be no adequate reason why a patient's comfort and luxury may not be considered.

As for pictures on the walls that is a matter for each individual institution, and, if any are used, they should depict cheerful subjects, likely to take the mind of the occupant away from pain and the depressing influences of illness—prints of good originals, scenery, interesting ruins, and historical events. It should be a part of the cure in many cases to have a patient's mind diverted, and there is not very much in bare walls to hold one's attention away from himself. In children's hospitals heavy stensils may be used in colors, either as a dado or frieze. There are whole stories of these now—"Mother Goose," "Æsop's Fables," etc.

Of course, if the institution is to allow dust to accumulate behind these pictures, and allow the pictures themselves to be defaced and soiled, that is a proposition rather of censure for the institution than of the practice of having pictures. An institution that does not thoroughly clean every part of every room as soon as vacated by a patient and before another is admitted is neglecting one of the very first principles of institution management, and when we talk of hospital practice, or institution administration, we are assuming that things are done properly. Therefore, it should not be out of place to furnish cozy surroundings and some of the elements of luxury to patients in private rooms of an institution, whether it be a sanitarium, insane asylum, or general hospital.

Similar conditions do not exist in wards, either small or large. Even where there are two patients in a room it will be found impossible for many months at a time to adequately fumigate and clean the room, because there will always be at least one patient present. In wards accommodating several patients, such fumigation and proper cleaning can only be done under the greatest emergency, such as the appearance of a contagious disease, when all the patients must be taken out and

the room fumigated and cleaned thoroughly, and this will be found oftentimes to require a week or more, because the floors must be scrubbed and filled and refinished, the walls must be painted, and all of the wiring gone over, the pipes and radiators thoroughly cleaned, so that in these wards it would be impossible to have draperies in the windows or covers of heavy goods on the tables and dressers.

It is not quite so certain that, even in large wards, a few carefully framed, cheerful pictures would not be appropriate, and if there is a proper fumigation room in the institution these can be removed to it occasionally and every visage of infection destroyed.

BOOKS

As for books for patients, there is no doubt they may carry within their pages micro-organisms that cannot be destroyed by any ordinary fumigation. Numerous tests have been made under laboratory conditions by the great libraries to determine the facts on this subject, and it has been found that even so easily destroyed a germ as the pyocyaneus, planted within the leaves of a volume, will resist the most extensive formaldehyd fumigation. So that while books and magazines would be in many cases most excellent diversion for patients, the dangers arising from their promiscuous distribution are so great that the practice should not be entertained. Books may be brought in by the friends of patients, and, if there is an adequate control of their circulation, there would seem to be no good reason why they might not be passed from one to another clean case, or from one case to another in which there is no micro-organic influence at work; but the circulating-library business of an institution is a dangerous one, and ought not to be encouraged.

RECEPTACLES FOR CLOTHING

Private rooms usually have ample closet room for patients' clothing, and are furnished with chiffoniers and dressers sufficient for all the needs of the occupant of the room. There are other parts of the hospital, however, in which there must be accommodation for the keeping of clothing, hats, shoes, and the hanging of garments. Figures 104 and 105 show a most convenient form of locker. Usually it is made two sections in one piece, each section 15 inches square on the inside and about 5 feet high, with beveled top. It may be had with one, two, three, or four compartments or stories, according to the use to which it is to be put. The single compartment locker has a far greater usefulness in many parts of the house than that in which there are divided compartments, because it permits the hanging of dresses, trousers, and coats without folding.

There is a shelf a few inches from the floor on which the shoes may be kept, and a second shelf a few inches below the top for hats and small articles, while the rest of the locker is fitted with hangers. This locker is a most useful piece of furniture for private wards, for the surgeons' dressing-rooms, and in the operating suites for the nurses' locker room and for the use of visiting physicians. It is fitted with a good lock, with upper and lower lock bar that prevents the prying open of the door either from above or below. It takes up very little room, and, being made in two sections, is flexible enough to be used in private wards. A sufficient number of these lockers can be placed against the wall at almost any part of the room not occupied by the bed, and its use is a source of great satisfaction, not only to the occupants of the wards, but to the nurses and orderlies and workers generally,

because it is not an infrequent occurrence that patients will take each other's things unless they are kept under lock and key.

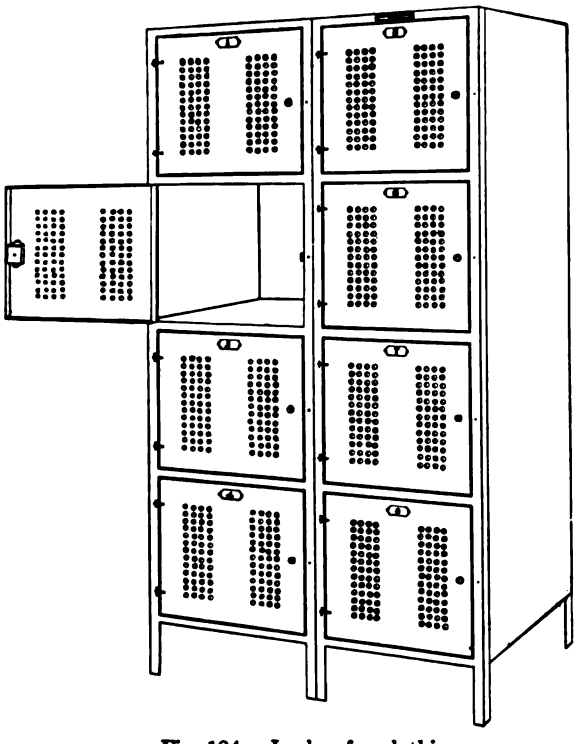


Fig. 104.—Locker for clothing.

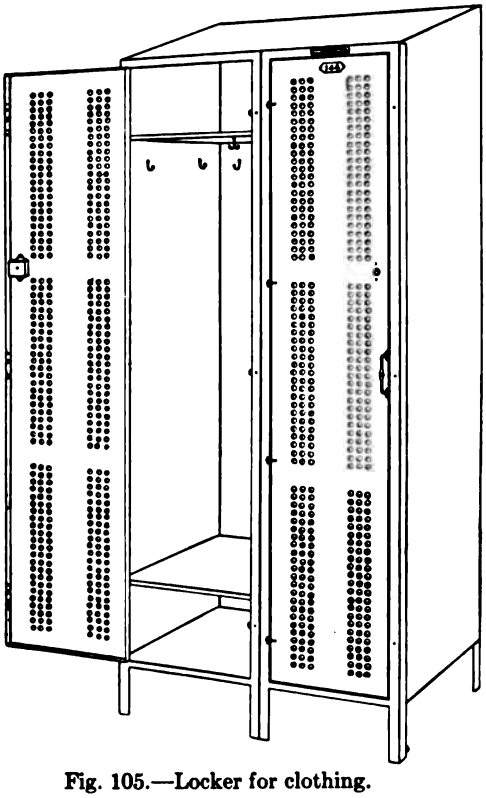


Fig. 105.—Locker for clothing.

This is rather an inexpensive article of furniture, costing about $5 for each section. If it is not necessary to hang up outer garments and night clothes, the lockers may be in two sections, or even three or four, and then can be used like a chiffonier.

EQUIPMENT OF THE OPERATING-ROOM

THERE is a disposition among surgeons, interns, and nurses to litter up operating-rooms with apparatus. Perhaps such a statement as this ought to be qualified by stating that where this tendency does exist a good many surgeons operate. In other words, in the modern hospital that practices the open-door policy, allowing almost any surgeon to schedule an operation, each surgeon will want a lot of things of his own, special instruments and special technic. In order to accommodate each

Fig. 106.—Operating-room too full of furniture.

one of these men in their own way, the operating-room interns and nurses keep adding things to the operating-room equipment until they have right at their elbow almost everything that anyone can want for any operation under any circumstances. In order to accommodate all these etceteras of operating procedure it is necessary to have a lot of shelf stands and tables, until the operating-rooms become so clogged with paraphernalia that no one can move about.

The ideal operating-room can be obtained, of course, when there is only one man who works there. The furnishing of such a room can be of the plainest sort, and ought to be; the operating table, the instrument tray that sets above the

patient, a table and stool for the anesthetist, and perhaps a shelf stand over in the far corner of the room are about the only pieces of furniture needed. Everything else can be in an adjoining room, presided over by one careful nurse, who can pass out additional instruments, packages of combination, sponges or packing, and who can take away the used sponges. It goes without saying that this annex room must be a sacred place, not open to the intrusion of anyone, and the presiding nurse must be one who can be implicitly relied on, both as to efficiency and conscientiousness. Such an arrangement as this presupposes a single surgeon, with a minimum number of assistants and a simple technic.

Fig. 107.—Dr. William J. Mayo's operating-room.

The two extremes of operating-room furniture are shown in Figs. 106 and 107.

In Dr. William J. Mayo's room a "sister" is the only assistant, and she works opposite the operator all the time, year in and year out. There is a nurse placed over against a far wall where the instruments are, and whose duty it is to see that the operator gets what he calls for and to keep out of the way. An intern is present in the room, having brought the patient upstairs; he will also return the patient to bed; his only other duties are to read an extract from the record when called upon and to thread a needle occasionally. He renders no other assistance. This system, however unsatisfactory it may be from the standpoint of the intern and nurse in the matter of training, is certainly simple. The operator has a perfectly trained assistant, and does his work expeditiously and without any unnecessary fuss at the hands of beginners.

In the Michael Reese Hospital (Fig. 106) there are always five assistants and generally six—an anesthetist, a senior assistant, and three nurses, an instrument nurse, sponge nurse, and "supe" to take away, count, and hang up used sponges, pass needed articles to the instrument nurse, etc. Generally there is a second senior medical assistant to hold retractors, especially in deep abdominal

work. Different institutions have different ways of doing these things, all the way from the simplicity of Dr. Wm. J. Mayo to the intricate technic of the Michael Reese Hospital. It is the personal judgment of the author that there is a happy medium between these two extremes, and that a small amount of operating-room furniture can be used advantageously; but it should be kept out against the walls and away from the center of the room. Of course there is a fair probability that Dr. Wm. J. Mayo goes farther in the way of simplicity in furniture, in order to accommodate his custom of wheeling the operating table about the room at various interesting stages of the procedure, to show the field to the clinic occupying two sides of the room.

Fig. 108.—McArthur's head rest.

Operating Tables.—It is a peculiarity of the surgical profession that, as soon as one of its members has got far enough along to be on speaking terms with a definite technic, the first thing he does is to develop original ideas on the subject of operating tables, until there are about as many designs as there are surgeons. Fortunately, most of the new ideas are developed around tables already in the rooms, and consist of pieces that fit into sockets made for something else—shoulder pieces leg pieces, head pieces, and pieces to accommodate almost every inch of the body for some special operation; and fortunately, again, storage rooms for junk are usually at hand to swallow up in their dusty caverns most of these ingenious devices "until they are needed."

The only clearly discernible fact about operating tables is that no two operators can be appeased by any one table, and the wise hospital administrator who needs a table will fix the maximum price he is willing to pay for it, and give the operator who is to use it carte-blanche within those figures to go and buy what he wants. If several surgeons are to use it, he has one of two horns of the dilemma to choose from—either give over the selection to the surgeon who seems to know what he wants, and makes the greatest row if he doesn't get it, or ignore all of them and buy the table himself. He can then stay out of the operating-rooms until some new and greater calamity comes to divert everybody's attention.

If this latter course is chosen, a few principles in operating tables ought to be kept in mind. In the first place simplicity is a jewel, and complications breed woe at critical times. The table that "works like a charm" in the show rooms generally fails to work at all when some instantaneous move must be made, perhaps to save a patient who has suddenly gone to the bad. Any one of half a dozen tables readily admit of a satisfactory Trendelenburg, Cunningham, and the various lithotomy positions.

There are some points about the Hartley table, made by the Hospital Supply Co., after the design of Dr. William Hartley, of New York, that make it perhaps the most satisfactory of all, taking everything into consideration, that it admits of the Trendelenburg, lithotomy, and Cunningham positions in all their variations. Only in one or two slight particulars does it fall short; one of these is that the shoulder braces for the position of perineal prostatectomy are too low down, as they allow the patient to slip forward, so that the surgeon must work over the edge of the table, which prevents free access to the field of operation. This can be remedied,

Fig. 109.—Hartley operating table in Trendelenburg position.

however, by a little different design of the shoulder brace, giving it an arm that will throw the brace about 4 inches lower toward the foot of the table. This arm can be made, with sliding set-screw attachment, to meet the requirements in any size of patient. Another detail in which the Hartley table seems to not quite meet all the demands in brain surgery is in the fixed head rest. These head rests have an extension arm, and they do not provide against vibration in chiseling operations which they are intended to do. Dr. L. L. McArthur, Dean of the Michael Reese surgical staff, has added to the table for brain operations a simple, strong head rest, composed of a heavy upright piece of tubing set upon three legs; a strong

cup is fixed at the top of this stand to rest the head in. This form of head rest can be raised or lowered, either by set-screw attachment at the junction of the legs or by archimedian screw or worm gear; the head cups are made in several forms, to fit the head in any position. The Hospital Supply Co. makes this head piece, a cut of which is shown in Fig. 108.

The hot-water containers in some operating tables seem not to be desired by most surgeons, and, where the hot-water containers are present, they are rarely used, except in cases of small, very delicate children; and for work with children, the complexities of the Hartley table are in no demand whatever, so that for

Fig. 110.—Hartley table in position for kidney work.

childrens' surgery the simplest form of table is one in which the whole table is a warm-water container, and the only movement required one that will raise the body and lower the feet, or vice versa.

Whether the operating table shall have a white enameled, or glass or gun metal or bronze top, is rather a question of taste. Perhaps the top made of cast steel with baked white enamel—that new form of table top that seems now to be fashionable—may be finally agreed upon as the most easily cleaned as well as the most durable top. Glass is more easily broken, but it is more easily kept in good condition, and it certainly gives a comely appearance to the table. Gun metal,

steel, and brass are eventually marred by contact with acids and blood, but any of these tops will give satisfaction, and the question of which one shall be used is hardly worthy of serious discussion.

Whatever table is used there ought to be large ball-bearing rubber-tired wheels, with a locking device that will hold them absolutely when the table is in use. It is extremely desirable to have good wheels, because in most modern hospitals patients are anesthetized on the operating table itself, so that it will be unnecessary to drag them about from the stretcher to the table. It is quite as necessary, however, to have an attachment that will lock the wheels, so that the table will not move about under the surgeon's manipulations.

Fig. 111.—Shelf rack.

Figure 109 shows a Hartley table in the Trendelenburg position. A glance at the shoulder braces will indicate the defect pointed out above. The same table is also shown in position for kidney work (Fig. 110).

Shelf Rack.—The next most important piece of furniture in the operating-room is the shelf rack, shown in Fig. 111.

This rack is made of two pieces of gas pipe, white enameled, 5 feet apart, connected by shelving of heavy plate glass. The feet are shod with rubber tips. This shelf usually contains the various powders, catgut in its various forms, some

Fig. 112.—Instrument tray stand.

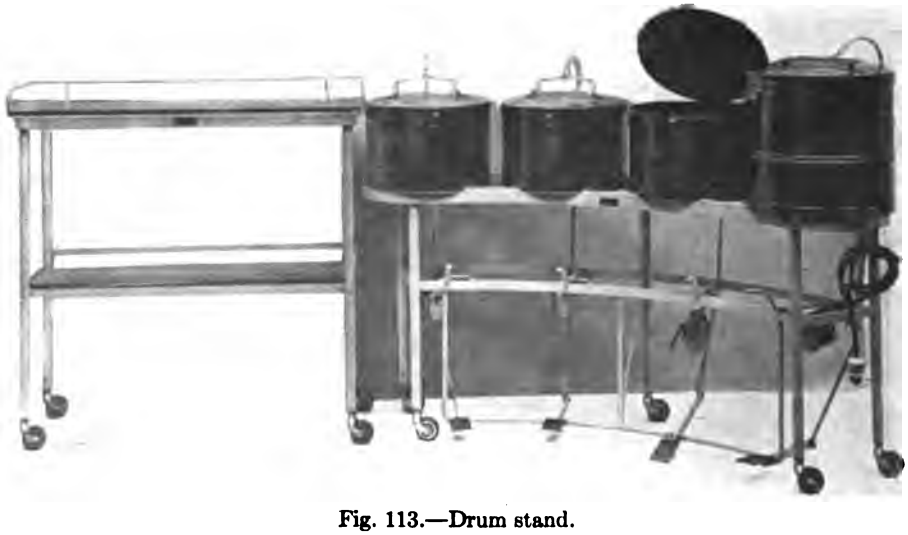


Fig. 113.—Drum stand.

few solutions in small quantities, and jars containing gloves, iodoform gauze wrapped in oiled paper, plaster-of-Paris bandages, adhesive rolls, and odds and ends of operative procedure.

Instrument Tray Stand.—The instrument tray stand is indicated in Fig. 112. This is merely a stand on wheels, made of four tubular, white enameled legs, joined by enameled brass angle iron at the top; and another section of the same, 14 inches lower down, with angles made so that the instrument trays set into their respective places securely. The whole table is 36 inches high, 43½ inches long, and 11⅞ inches wide. The instrument tray that belongs to this stand is made of perforated metal of any kind, preferably aluminum, because of its non-corrosiveness. The objection to the instrument tray is inability to find a handle that will not heat, or that will cool quickly; but this objection is common in all the makes, and is overcome by the use of metal handles, made in the shape of retractors. The tray handles are picked up with them.

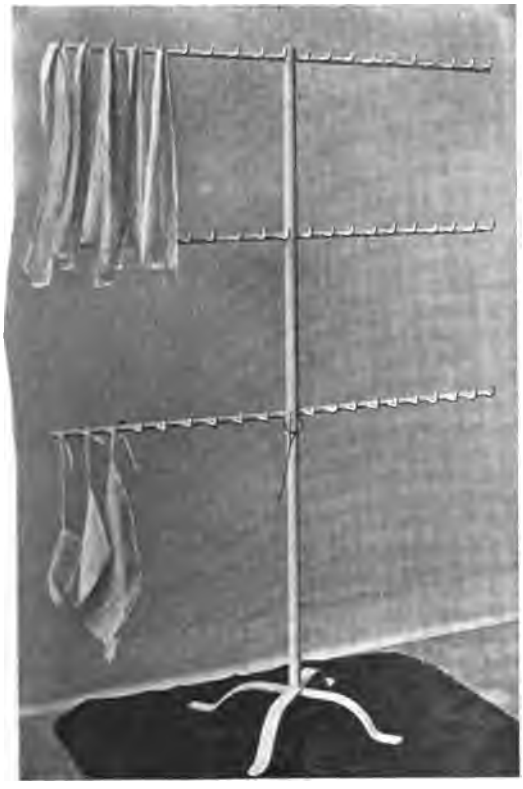


Fig. 114.—Sponge rack.

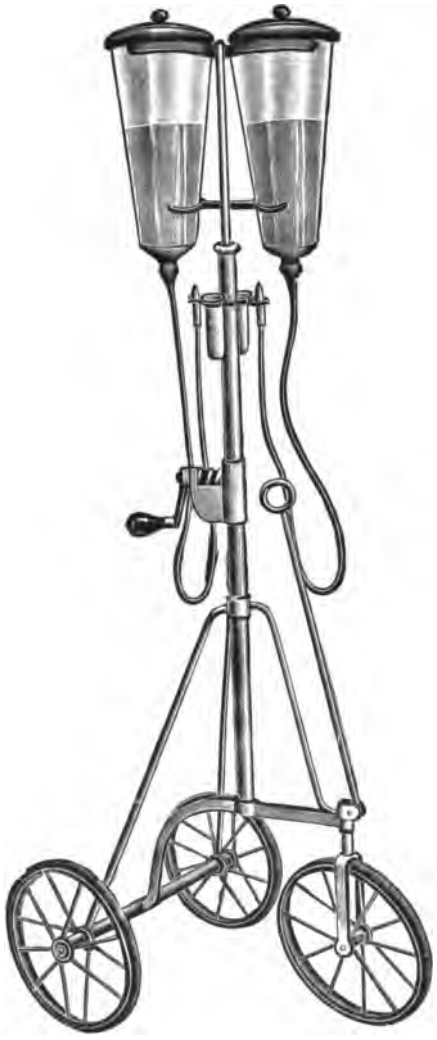


Fig. 115.—Irrigator cart.

Drum Stands.—Most modern hospitals use their sponges, packing, and various dressings directly out of laparotomy drums in which they have been sterilized. The stand for these drums operated by foot-pedal is shown in Fig. 113. This stand was designed for the New York City Hospital, and is a most convenient and necessary piece of operating-room furniture. The table shown in connection with the stand is not necessary, and serves to render the whole piece of furniture

cumbersome and awkward to handle. A much smaller table upon which to handle the dressings will answer every purpose, and, being independent of the drum stand, can be moved readily, and the whole equipment will be much more convenient for that reason. The drums themselves are circular in shape, 10½ inches high, 14 inches in diameter, and operate by means of a triangle fastened into the top, which hangs in the arm extension of the foot-pedal.

The fastening device is a staple and hasp that may be locked by a padlock. The circular band of metal around the top and another around the bottom, perforated to fit similar perforations in the drum itself, serve to open and close the drum as it enters and is taken from the sterilizer.

Fig. 116.—Arm immersion stand.

The electric drum, made similar to the ordinary drum, but 13½ inches high instead of 10½ inches, containing electric-heating coils on the inside, and designed for St. Luke's Hospital, New York, seems to be a superfluous piece of apparatus. The coils soon burn out, and the utensil is rendered useless.

Sponge Rack.—Figure 114 shows the best style of sponge rack for operating-room use. It consists of a standard mounted on four feet, 60 inches high, with three horizontal bars, 40 inches long, 14 inches apart, containing hooks 2 inches apart. There must be ten hooks on each side. This sponge rack is designed by the Michael Reese Hospital, especially with reference to the make-up of the drums, described on page 352 in the section on Operation.

Irrigator Cart.—Figure 115 shows an operating-room irrigator cart designed for the Michael Reese Hospita.l A worm gear in the telescope upright raises and

lowers the irrigator jars, and the mechanism is on wheels, so that it can be moved readily. It is perhaps the best irrigator arrangement for general use in the hospital, as well as for the operating-rooms.

Instrument Table.—The instrument table for the surgeons' use is merely an extension of the principle of the ordinary bedside table. Instead of special fittings this table may rest in a socket designed for that purpose as a part of the table. There are no advantages in any particular make.

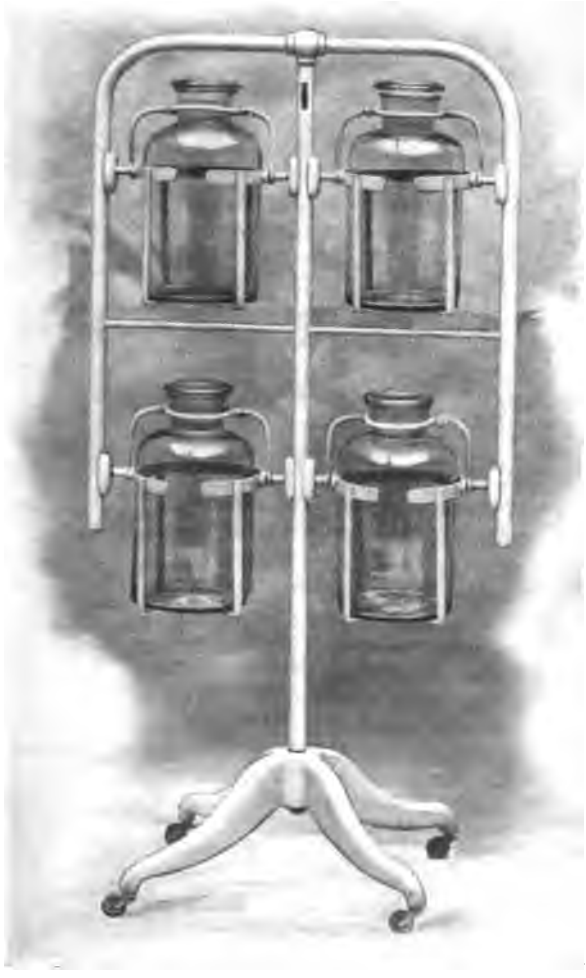


Fig. 117.—Solution rack.

Arm Immersion Stand.—The arm immersion stand for operating-room use is shown in Fig. 116, in connection with the solution basins. This combination of basins and stand is to be preferred to the two separated, since the immersion stand in this case takes up no more room and serves every good purpose. It is made of any metal that will permit a permanent burning in of white enamel. In most of them the enamel soon chips and the metal rusts, a most undesirable thing where asepsis and cleanliness are prerequisites.

Solution Rack.—A somewhat cumbersome and quite costly piece of mechanism,

yet one that will oftentimes serve a very good purpose, is the solution rack, shown in Fig. 117. The purpose of this rack is to contain various solutions in large quantities. It was designed for battleship use in the United States Navy, and is so arranged that the sections can be turned upside down, or the upper tier of bottles can be changed to the lower tier by release of a spring and with simple hand movement. It is not worth the price asked for it for land hospital uses.

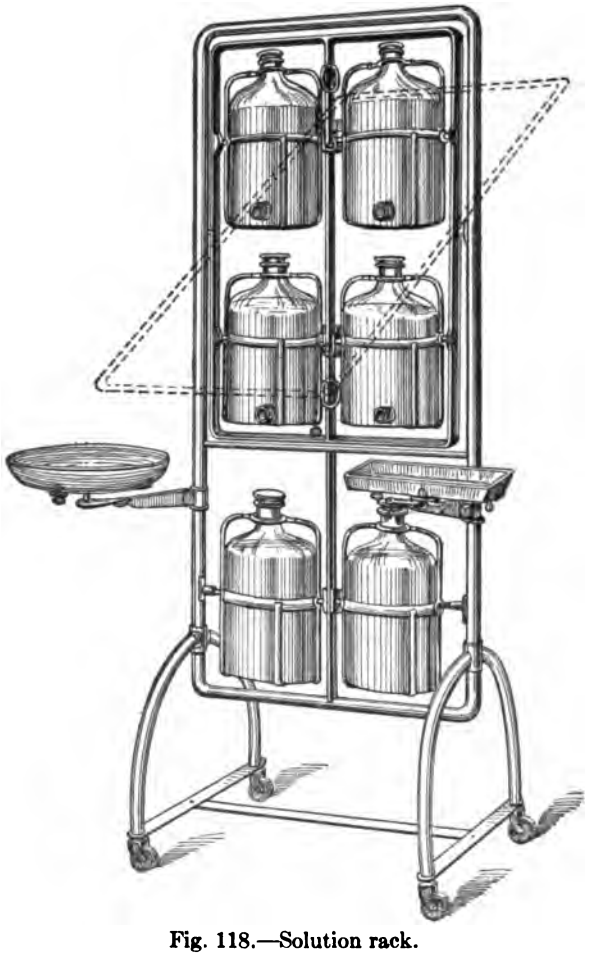


Fig. 118.—Solution rack.

Goose-neck Reflector.—Figure 119 shows a goose-neck flexible reflector light for operating-room use, designed by Dr. Greensfelder for the Michael Reese Hospital. The advantage of this particular style of reflector is mobility and the flexibility of its light to any point for a survey of the field. It is made by the Hospital Supply Co.

Operating-room Sinks.—There is very little to be said about the operating-room sinks, excepting that they shall have abundant shelf room beside the basins, to contain the jars of sterile brushes, nail files, Schleicht or marble-dust soap, and green soap. The faucet connections may be either knee, elbow, or foot movement, but, in either event, must be so connected that the flow of water, both hot

and cold, must immediately stop with the removal of the elbow or foot. In a good many hospitals, where there is a knee action, the movement of the knee starts the flow, but does not stop it. In nearly every hospital the wash water in the operating-room is sterile, which means that it has cost fuel to make it ready, and fuel costs money. Where the movement is of this character it is the habit of surgeons to start the water and let it run, and sometimes it is left running during the whole of an operation, which will always mean a drain on the coal pile. Surgeons, as a rule, object to mechanism in which the water stops running with the removal of pressure. The reason they give is that it requires too much attention to attain the right temperature of water; this, however, is merely an inconvenience to them and requires a little more of their attention, while the constant flow type of the faucet means a constant drain on the coal pile, and this, repeated throughout the house, runs into money rapidly.

Fig. 119.—Goose-neck reflector.

Whether the action of the faucet shall be by movement of the elbow, the knee, or the foot is rather a question of taste and convenience; the foot action answers every purpose, with the pedal low enough to rest on the floor, and thus give a fulcrum to the foot when the pedal is pressed upon. There are knee action, spring faucets with some of the newer plumbing, but they do not act smoothly, and surgeons object to them because too delicate adjustment is required to obtain the right temperature of water.

Soap Containers.—There is a universal demand for a green-soap container, fixed to the wall above the basin, operated by foot or knee action, that will release the green-soap solution in a practical, convenient way. There seems to be no such device on the market. There are a number of these soap containers offered for sale, but they soon get out of order, and after the soap has been in them for a few hours they clog and fail to operate. Such a piece of apparatus of a workable sort, practical in its operation and that would not get out of order, would fill a much-needed place in operating- and dressing-rooms.

Instrument Cabinet.—A very necessary piece of furniture, not for the operating-room itself, but that must be nearby, is the instrument cabinet. Figure 120 shows such a cabinet of practical design, easily cleaned, and well lighted. The beveled top and back are of sheet metal, white enameled, and the door frames and front are of angle-iron white enameled. The shelves and doors and ends are of plate glass, giving at all times a full view of the instruments in the cabinet, and making it cer-

tain that dirt and dust can be readily seen, and hence the cabinet will be kept clean.

It does not seem desirable to have these instrument cabinets very large. The one in the cut is 72 inches wide over all and 84 inches from the peak of the beveled top to the floor. It would seem preferable to have more than one cabinet rather than a larger one in one piece because of the difficulty in moving, and also because there will rarely be a location where a greater space than this can be well lighted. It will, of course, be necessary to have an excellent lock on all instrument cabinets, preferably one in which the turning of the key will release top and bottom plunge rods, so that the cabinet door cannot be pried open easily. The instrument

Fig. 120.—Instrument cabinet.

cabinet should be kept at a distance from the operating-room itself and from the sterilizing room, so that the instruments will not come in contact with the moisture and steam incident to sterilization and the use of hot sterilizer instruments in the operating-rooms.

Every cabinet should contain a hygrometer, or moisture gauge, and these gauges should be inspected frequently and heeded, in order that the instruments may be kept dry and free from rust.

Purely Technical Apparatus.—There are certain pieces of apparatus that do not properly come under the head of furnishings, and are not necessarily a part of the equipment of the operating-room, apparatus that might be classed as instru-

ments perhaps, but some of these things are so common in the operating-room of to-day that, by stretching a point, we may call them a part of the mechanical equipment. Some of these things are:

The gas anesthetizing apparatus, bone drill, cautery machine, and electric battery designed for lighting cystoscopic lamps.

Anesthetizing Apparatus.—The anesthetizing apparatus, for the giving of nitrous oxid gas over long periods of time in certain classes of operative cases, is a very important mechanism. Figure 121 shows this apparatus, designed by the Michael Reese Hospital, in use in that institution for the past four years. Another

Fig. 121.—Apparatus for administering nitrous oxid gas.

design for the same purpose, and quite as efficient in its operation, has been made by the Teter Manufacturing Co., of Cleveland, Ohio. The Michael Reese apparatus has never been placed on the market, but is made on order by the Chicago Surgical and Electrical Co., Chicago. The mechanism consists of a stand with double arms at the top. On one side are the two oxygen tanks, and on the other the nitrous oxid tanks. On each side, and between the tanks and the upright of the stand, is a gas-bag, one to contain nitrous oxid gas and the other oxygen. Valves are placed at various points, by means of which the gas or oxygen is released into the bag. There are several varieties of the bag used; that made by the Teter Manufacturing Co., of pure gum with twine-net covering, is the best, as it is elastic, and either the

oxygen or nitrous oxid can be kept under pressure, so that it can be paid to the patient as required. There is a 5-foot tube of woven silk with rubber lining leading from the tank to the face-mask. This tube is kept expanded by wire coils inside. The face-mask used is a patented article, sold by the S. S. White Dental Manufacturing Co., the chief feature of which is a rubber air-cushion rim that fits tightly about the face of the patient, so that all outside air can be excluded.

By all odds the chief factor in gas anesthetization is the operator, and the giving of continuous gas is so much of a modern art that the subject will be treated in detail in a special section in this book, under the heading "The Anesthetic," from the administrative standpoint.

The Cautery Apparatus.—There are many types of cautery outfits on the market; most of them have only a small output of current, sufficient for heating small cautery knives; others have a large output of current, only suitable for the heaviest electrodes.

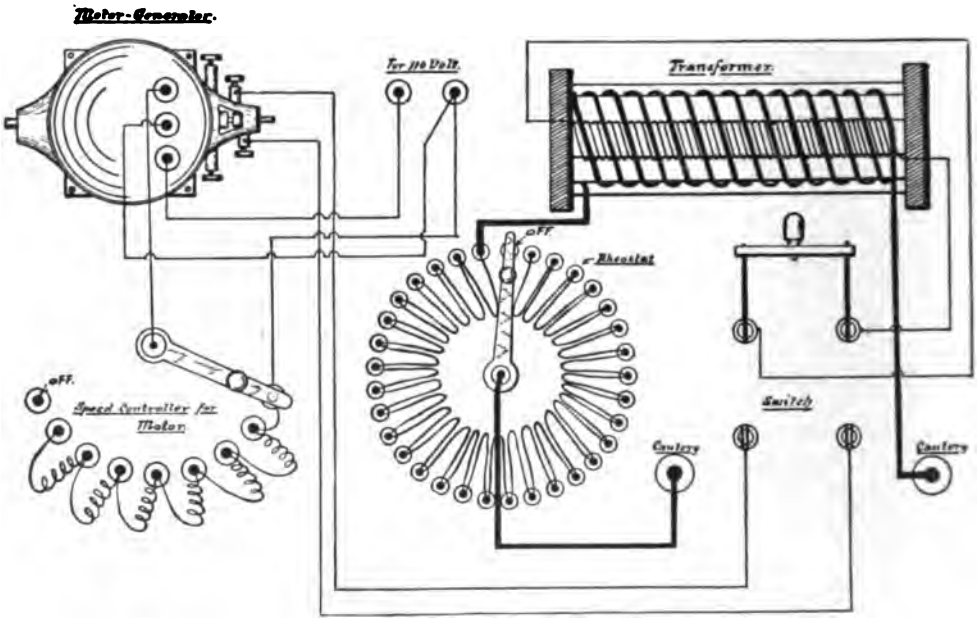


Fig. 122.—Cautery apparatus.

The diagram shown herewith (Fig. 122) illustrates a cautery apparatus that has a wide range of output, making it possible to heat anything from the most delicate cautery knife to the heaviest electrode. It consists of a small, but powerful, motor generator, which changes the direct current into alternating, which in turn is converted through an induction transformer into a cautery current. Perfect control of the output is afforded by means of two wire rheostats. The speed-controlling rheostat regulates the volume of the alternating current before it reaches the transformer. When no current is taken from the transformer the motor runs freely, and does not consume a wasteful amount of electricity. This method of control also assures a full efficiency of the motor. The cautery-controlling rheostat controls the current supplied to the cautery electrode from the transformer, and has a range of current wide enough to heat the smallest cautery knife as well as the heaviest electrode, without danger to the one or fear of inefficiency in the other.

A common annoyance with heavy cautery electrodes is the frequent breaking of the porcelain tips carrying the platinum wire. This has been eliminated by using a specially made lava tip instead of porcelain, as lava is extremely tough and practically indestructible. Lava also retains heat much longer than porcelain, which adds to the efficiency of the electrode. In coming in contact with blood or any other liquid, the porcelain tip often cracks in several pieces while the lava tip remains intact.

The base of the cautery apparatus may be slate or marble, as they cost about the same and are equally efficient. Either will break if allowed to fall, and, as the apparatus must be mounted on a portable carriage for use anywhere in the insti-

Fig. 123.—Author's bone drill.

tution, it is necessary to choose carefully the vehicle on which to set it. There should be large, easy running wheels, set under standards spread well apart, so that the outfit will not tip over easily.

This apparatus operates off an ordinary lamp outlet, using a common drop-cord socket.

Bone Drill.—For many years—that is, ever since brain surgery became a scientific practice—surgeons have demanded an apparatus that would give them more than the trephine, an apparatus that would permit the making of large bone flaps, through which major operations, such as removal of tumors and exploratory examinations, may be done.

There are three forms of mechanism offered on the market for this purpose:

One is the hand apparatus, on the principle of the brace and bit; the other is an adaptation, with modified tools, of the dental drill; the third is the direct employment of the small motor with the tool fastened in its armature.

The end desired in a bone drill is not only to cut through the bone, but to do so rapidly, in any direction and in such a way that the dura mater will not be wounded. Some excellent surgeons prefer one of the instruments suggested and some another. Largely, however, it has been a matter of dexterity and skill on the part of the surgeon himself, and he has divided the honors with his instrument.

Speaking broadly, none of the three mechanisms does the work well. The brace and bit mechanism is awkward, works slowly, and is likely to plunge down upon the dura, even in the most delicate handling.

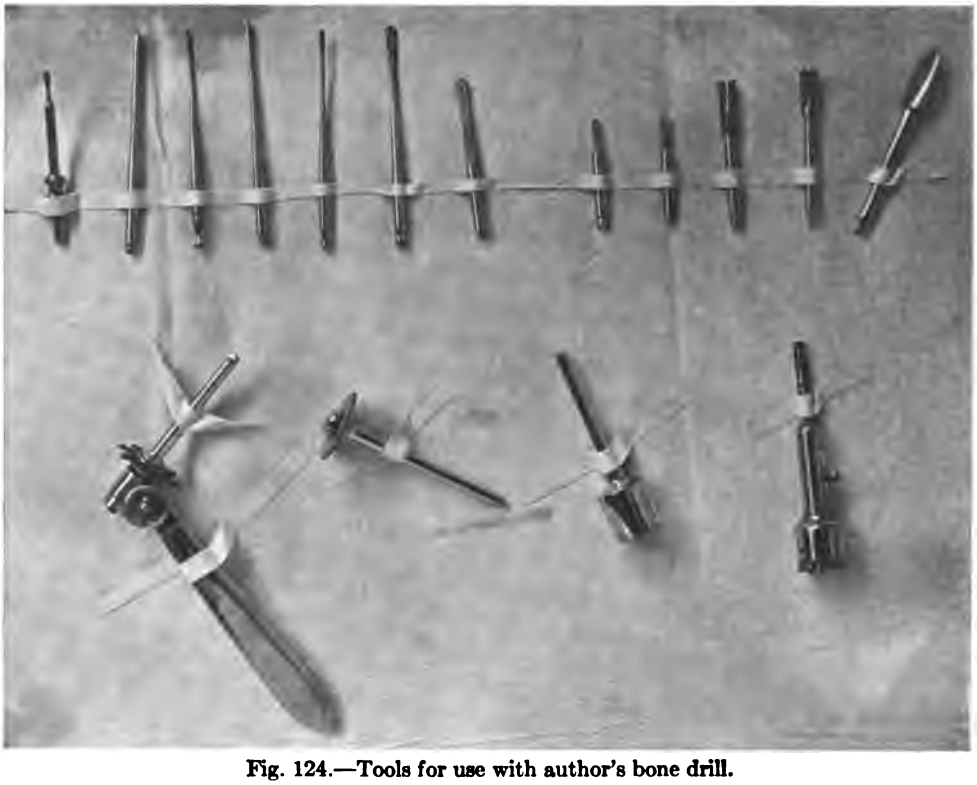


Fig. 124.—Tools for use with author's bone drill.

The second mechanism is that designed by Dr. Hartley, of New York. It is heavy, too difficult to control, and more likely even than the hand mechanism to plunge down upon the dura, because the operator must hold the eight- or ten-pound motor up against his chest or abdomen, and has no substantial leverage by which to delicately control his pressure.

The dental drill is very much too small an affair, either to drive a trephine or any tool of considerable size. The author has designed a bone drill, shown in Fig. 123, that some of the surgeons have been good enough to say meets the requirements of brain surgery. It has been necessary, however, to design also a number of tools different from those heretofore in use, a group of which are shown in Fig. 124. This apparatus consists of a half-horse, shunt-wound, direct-current motor that drives belt-wise the rotating drill that has its movement in the covered cable, as

shown in the cut. The 6-foot cable shown in the hand of the operator is made of bundles of steel wire wrapped. The covering is a flexible steel tubing used by the electric people for interior conduit work, enclosed in a leather case treated with an oil-asbestos preparation that permits its sterilization. The tool holder at the end of the drill is a clamp operated by the finger, in which a turn or two releases or tightens the tool, and there is a shoulder at the end of each tool that fits into the end of the clamp.

There is no new principle in any of this mechanism. It is the application of a large number of old principles to achieve the desired result; and the only particular

Fig. 125.—Examination chair.

in which this apparatus differs from others is the increase in driving power of the drill, the flexibility and workableness of the moving mechanism, the difference in some of the tools, and the fact that the shunt winding of the armature allows the operation of the full power of the motor on either slow or fast speed. One of the surgeons who uses this drill makes three trephine openings, forming a triangle, slips a flexible steel duck-bill director into one and along toward another, between the dura and the bone, and works the saw above the director.

The Victor Electric Co., Chicago, has recently put on the market a very excellent machine that wants very little improvement, namely, a good hand-hold in the

tool mechanism. They also do not make a good or serviceable variety of tools. The machine is made to set on a table, which is not the best arrangement, since very often there is no convenient place to set a table. The author's hand-hold is far better than theirs, and his small tower on wheels is more adaptable to the space of an operating-room. Their tool-clamp method is better than his.

Cystoscopic Battery.—The small lights in the cystoscope and proctoscope are made to work at four volts direct current. Ordinarily, operators take their current for these lights from the regular lighting circuit in the institution, using a rheostat to lower the voltage. Those who have used these instruments know how frequently their lamps burn out while they are making an examination, necessitating the removal of the instrument constantly, a lot of pain, the insertion of new lamps, and a second introduction of the scope, with additional great pain and loss of time. The

Fig. 126.—Eclipse head lamp in use.

burning out of these lamps is due to irregularities in the voltage of the lighting circuit itself. The scheme, then, is to provide a current of electricity that will light these small lamps up to their maximum voltage, and that will, under no circumstances, permit of a high enough voltage to burn them out. The author has made for this purpose a small battery, composed of 6–1 ampere, one volt dry cells. The cells are placed in a box connected in series, and a simple button switch is placed on the top of the box, with the two connections at the side. With this mechanism one may turn the switch from one to six cells (that is, from one to six volts, and the battery is not capable of a higher voltage, so that the lamp will under no circumstances burn out. This little device can be made by the electrician on the corner, and it has given great satisfaction to the genito-urinary surgeons who have used it.

Special Apparatus for Special Departments.—In the eye, ear, nose, and throat operating-room, or in the case of the small hospital, the special apparatus that will be required for eye, ear, nose, and throat operations are an extension light, a head lamp, and a special chair. This apparatus need not be expensive.

Figure 125 illustrates a convenient, inexpensive, and competent examination chair, and one that will do very nicely for the simpler operations that require only local anesthesia. This is merely a strong chair, with support for the back of the head. There are many more elaborate chairs than this, some that hold the head by a clamp action in precisely one position. Such an apparatus is not only costly, but it falls far short of the purpose intended, in that the effort on the part of the

Fig. 127.—Dressing cabinet.

patient to get away from the instrument and the inflexibility of the head support make it all the more difficult for the operator to keep the head where he wants it. It is the experience of nose and throat men that the patient whose head rests easily, and without a clamp, will hold still much better than one whose head is fixed immovably.

Figure 126 shows the eclipse head lamp, which has perhaps fewer disadvantages and more advantages than most others. The reflector is bell shaped; the lamp itself is small, by comparison; the combination allowing the light to be thrown into a rather narrow field in front of the operator, whether it be the field of operation in a deep laparotomy or mastoid, or whether it be the examination field in the throat,

nose, or ear. This lamp is commonly used by nose and throat surgeons in the performance of tonsillectomy and the removal of adenoids. A particular advantageous feature is the mechanism of the head piece, which is formed of a pad of asbestos felt. Unfortunately, the cover to this felt asbestoid is made of a cheap black-colored cambric, which runs when the operator perspires. This may be avoided by lightly sewing on to the head piece a band of oiled silk. This lamp may be had of almost any of the surgical supply houses, and costs about $5.

Dressing-rooms.—The dressing-room is a place where much work is done, but where little apparatus need be used. A regular operating table of almost any

Fig. 128.—Dressing carts.

design, or a gynecologic chair, may be used for the patient. Whichever is employed, the coverings must be so arranged that the waters of irrigation will run immediately into a basin or bucket on the floor. This can be done with rubber cloth, a Kelly pad, or a Burr bath apparatus.

The most important article of furniture in the dressing-room is the dressing cabinet, illustrated in Fig. 127. The drawers of this cabinet will hold practically all the details of any dressing, and the shelves will hold the solutions, powders, syringes, and whatever jars may be required. The only advantage of this particular form of cabinet is in the large number of drawers it contains and the ease of access to those drawers.

The basins, percolators, and general furniture are practically duplicates of those used in the operating-rooms.

Dressing Carts.—One of the handiest pieces of dressing-room apparatus, although it is not used in the dressing-room itself, is the dressing cart, illustrated in Fig. 128. This is merely the three-wheeled percolator cart with worm gear, made by the Hospital Supply Co. especially for the Michael Reese Hospital, and elaborated by the author by the addition of shelves, as indicated in the illustration. The percolators may be filled with the necessary solutions; the turret at the top may be filled with powders and whatever solutions or drugs are usually employed in the dressings; one of the shelves may contain a basin to be used for catching the waters of irrigation, and the other shelves may contain instruments, bandages,

Fig. 129.—Gynecologic table.

adhesive plaster, gauze, and dressing drum. The particular advantage of this cart over others that are offered for sale is in its ease of handling, because of the shortness of the cart, the single front wheel, and the movable tongue. The cart may be wheeled into the ward or into a private room for the dressing of a patient that cannot be taken to the dressing-room proper.

Gynecologic Table.—In the gynecologic dressing-room the only feature that need be mentioned is the dressing-table itself, illustrated in Fig. 129. This dressing-table is simple in its construction and design, comparatively inexpensive, with enameled metal top and moving mechanism to place the patient in any of the classic dressing positions. The step on the side, as shown in the illustration, differs somewhat from most tables, in which the step is at the foot of the table, and this seems to be a desirable arrangement in the estimation of a good many gynecologists.

EQUIPMENT OF THE KITCHEN

Ranges.—The size of the institution and the consequent size of the kitchen will make very little difference in the arrangement of the kitchen for convenience. What will be convenient in one will be convenient in another, and what will tend toward sanitation and cleanliness in the one will tend toward the same virtues in the other. By all means the ranges, whatever their size and construction, should be in the middle of the floor. The make of kitchen ranges is not a matter of supreme importance. Most of those on the market answer the purpose intended. The good features of any range contemplate the concentration of heat on all sides of the oven, with an abundant supply of heat distributed to the top of the range.

The question of fuel may just as well be briefly discussed here, because the construction of the ranges will depend a good deal on the kind of fuel to be used. In this matter there is hardly a choice. Hard coal, when it can be had, is the only fuel for kitchen purposes. Gas, whether it be artificial or natural, is far too expensive; soft coal is too dirty, and its heat power is too low. Some illuminating figures might be given showing the relative economy of gas and hard coal. In round figures, gas, even when it is to be had at most economic prices, will cost at least four times as much as hard coal in any central part of this country and give less satisfaction. The exception in the use of hard coal is in the matter of broilers; it is doubtful whether coal will give that even distribution of heat for broiling purposes necessary to proper preparation of the food, and gas seems to meet these requirements far better. Almost any of the broilers and toasters on the market will meet their several requirements. Of course, the broiling and toasting must be done below the fire, and there will be a considerable economy in fuel if the flame burns against a heavy steel asbestos-backed plate, the heat radiating, not from the gas itself, but from the heated plate above. When this mechanical construction is employed the evenness of the heat can be much better controlled than where the heat of the flame itself is to be depended on. If there is to be very little broiling or toasting, and that little at long intervals, the heat of the heavy plate will require too much time and too much gas, but in most institutions there will be sufficient work to justify the heating of the heavy steel plate for each meal.

There ought to be shelves in the superstructure of all ranges for pans, spoons, forks, and kitchen tools generally that are constantly employed at the stove. If the cook can reach for these things without having to leave the front of the range there will be considerable economy in time. There should not be any arrangement for the warming of plates or dishes in connection with the ranges except in a very small institution, where a separate dish warmer would hardly pay; they will always be subjected to grease and the natural soiling processes of the range atmosphere.

The Kitchen Table.—The next most important thing in the kitchen is the table, which should extend at least the length of the range and broilers, and it cannot be made too substantial; it must certainly be made of 2-inch stuff for the top, and the best are made of 2 by 4 inch edge grain Georgia pine for the top. These two by fours are planed on both sides, and enough of them are laid side by side on edge to make the whole top of the table. If properly made there are no cracks, and these pieces can be bolted so tightly together that they make practically a solid top 4

inches thick. Of course there will be drawers for keeping all sorts of range, carving, and serving utensils. The drawers should not continue to the floor; there should be sufficient space underneath to permit mopping and cleaning; besides this, cooks like to stand close to the table when they are working, as the strain on the back will be less, and if there is no place under the bench for their feet they cannot stand close.

Dish Warmers.—In serving meals, naturally the cook and his assistants will stand between the table and the range. On the other side of the table will be the

Fig. 130.—Dish warmer.

serving maids or men, and just back of these servers is a place for the dish-warming apparatus, and this piece of mechanism is rather an important one. It need not be complicated in any way, but it should be of considerable size, large enough at least to hold all of the dishes necessary to be used for any one meal in all those portions of the house for which the food is to be served in the dishes. A good part of the institution will be served from the serving rooms on the floors, and the food will be transported in food boxes, to be described later.

This dish-warming apparatus consists of two upright metal pieces, preferably of ⅛-inch sheet steel or iron, strengthened with upright eye beams. Shelves are

placed between the uprights, made also of sheet metal, supported on eye beams, with central upright supporters made of eye beams if necessary. Each one of these shelves is turned down at the front and back edge for an inch, and just under each shelf will be a sufficient number of steam coils to serve the purpose; the width of the mechanism will be 12 or 14 inches. Figure 130 will give the principal points in this dish-warming mechanism. It is a very simple affair and very serviceable. The back and front can be closed with an ordinary duck curtain, and nearly all the heat will be retained when this curtain is drawn. It will be only necessary to turn on the steam fifteen or twenty minutes before the dishes are to be used.

Steam Table.—Another piece of mechanism in the equipment of the kitchen that must be chosen with care is the steam table. This article will be used mostly for cooking cereals over night and during the day, and keeping roasts and vegetables warm. Almost all of the steam tables on the market now are efficient and adequate to do any work called for, and there is hardly a choice, excepting perhaps in the material, finish, and the arrangement of the compartments. The steam baths and warming apparatus are practically the same in all of the makes, so that in buying a steam table there are practically two considerations only: first, to get a table large enough to do not only the present work, but in anticipation of future growth of the institution, and to get a table apportioned in regard to its compartments, so that it will meet the requirements intended. Manufacturers are not always the best judges as to how many vegetable, meat, and cereal compartments a steam table should have, and the purchaser must use his own judgment. The second consideration in purchasing a steam table is the price, and that will depend a good deal on the material used and the workmanlike manner in which the table is put together. We must remember that a steam table is intended to last a great many years—a generation—if properly made and properly used, so it would be false economy to select, for instance, galvanized iron or any material capable of corrosion, when a few more dollars would buy the best heavy copper.

Dish Washers.—If the dishes used by the nurses and interns and hospital help are sufficiently numerous, and can be readily assembled at one point, it may well be economy to install dish-washing machinery. In hotels this can readily be done because the dining-rooms are placed together and all the dishes placed approximately at one place; there is, undoubtedly, a good deal of economy to be practised in having dish-washing machinery when the dishes can be assembled in large quantities. With dish-washing machinery about as many people are required to do the work as where it is done by hand, but there is an immense saving in the time occupied in the work, and the people who are charged with the dish-washing work can then go to some other occupation.

In a dish washer there are two or three fundamental principles to be observed. One of these is that the dishes must be so fastened in the machinery that they will not move about and break, and at the same time they must be so placed that the insides as well as the outsides can be thoroughly washed. Economy of space for the machine is important because oftentimes there is not a great deal of room in the scullery for the machine; the mechanism must be simple, so that ordinary dish washers can manipulate it without danger either to themselves or to the machinery, and last, but by no means least, the mechanism must be of such character that water and slop and steam will not be allowed to get all over everything in the room, and there must be economy in water and, more especially, in soap.

There are several dish-washing machines on the market, the best of which, at least until very recently, is the Insinger machine, made by the Insinger Co., of Philadelphia (Fig. 131). This washer answers all of the requirements; it has two

tanks, each of which is operated by a propeller, driven by a motor placed at one end of the machine. The dishes are fastened in the crate so that they are immovable, and they do not touch one another; they remain stationary during the whole process, and the motion comes entirely from the water, which is propeller-driven in the tank. The dishes are first placed in one tank, which is filled with water at about 60° or 70° F., and the water is agitated by the propeller until the dishes are practically clean; there is an automatic arm working from above that lifts the crate out of the cold water into the next tank, in which the water is kept at the boiling-point; again the process of violent agitation takes place, and whatever residue of grease remains on the dishes is carried away and they are thoroughly cleaned.

Fig. 131.—Insinger dish-washing machine.

The boiling-point of the water is sufficient to sterilize the dishes, and it makes them so hot that when they are again lifted out by the automatic hoist they dry themselves thoroughly. This machine is made in several sizes, one with a capacity of 12,000 pieces per hour, another with a capacity of 5000 or 6000 per hour, and there are smaller ones. It would seem that any place that is not large enough to require at least a 5000 or 6000 capacity machine would hardly be large enough to justify the installation of such a plant.

With this particular machine the breakage is extremely small—in fact, a negligible quantity—and there are other machines that break a great many dishes, This machine costs more than most of the others, perhaps 10 or 15 per cent. more,

but the saving in dishes would more than justify the additional expenditure. Figure 130 shows this machine with the motor mechanism, one of the crates, the two tanks, and the automatic hoist.

The Blakeslee machine is of similar type, but the tanks that hold the water are round or barrel shaped, and the water enters at the top, from the sides, causing a whirlpool of water to pass down through the contents, tossing the china about in the tank, rubbing the glaze off, and breaking some. It is not very successful in washing cups.

The Hamilton Lowe machine is another model of a similar type, with the exception that it has the square tank, and the water goes through the same operation as in the Blakeslee. It requires a good deal of help, and the baskets that the china is placed in have to be raised and lowered several times during the operation. Furthermore, the china comes in contact with wire baskets and metal, which rubs the china and spoils the glaze, an expensive operation for a hotel or restaurant or hospital that uses high-class table ware.

The Garis-Cochrane machine was placed on the market with a view to washing dishes with speed and economy. In this machine the china is placed in wooden racks. These are then placed in the machine, several racks on top of each other. In the operation of the machine the soapy water is forced through a pipe with a small pump. This pipe is worked on a spiral, and the water circulates through the tank in the shape of a cross. At the end of each arm of the cross there is a T with a cap on the end, which releases itself, allowing the water to pass out between the T and the cap, making a circular spray. The force of the water is slight, passing as it does to and fro across the tank, washing as it flows. During the operation the machine is kept closed to prevent the water from splashing on the floor. Then the pump is shut down, and fresh water is turned on from the faucet, to go through the same pipe and through the same operation as the soap water has done, in order to rinse the dishes. This has been found impractical, as there is not force enough in the water to rinse the dishes properly. Furthermore, the whole operation is a slow one and expensive for that reason.

The Victor machine, which has lately been put on the market by L. A. Haustetter, of Chicago, an old hotel steward, is perhaps the simplest of all dish-washing machinery. It is strong, and built to withstand the wear and tear of heavy, constant work.

There are two water levels in the tank, one for the rinsing, which contains clean water, and the other the soap-suds for washing and removing the grease. The level of the rinsing water is kept at a higher level, by an automatic feed device, than the soap water, and there is maintained a constant flow from the rinsing to the soap tank, as over a dam, thus carrying the skum and grease from the clean to the soap side. But this flow continues across the soap tank, forcing the grease and skum on and out to some grease-catching device, to be destroyed or kept for rendering. There are two centrifugal pumps run by a motor, one pump for the soap water and one for the rinsing water. The water is pumped from the bottom of each tank into a spraying device above, and the water is used over and over, with the soap and skum constantly going over the dams out of the sphere of action. Each one of these spray plates contains 2000 $\frac{1}{8}$-inch holes. The china is placed in wooden baskets, having no metal, that do not move while in operation. As one rack is filled it is placed in the machine at the soap-water end, then another rack is filled and placed in the machine, pushing the rack previously put in ahead. This operation is continuous.

Two persons are engaged, one to assemble and place the dishes in the rack and

the rack into the machine, and another to take away and distribute those that are clean. Since the rinsing water is very hot the dishes dry themselves quickly.

It is claimed for this machine that it is not only more rapid in action, but that the water and soap required are less than in other machines. Figures 132 and 133 show the mechanism of this apparatus. It costs a little more than any of the other dish-washing devices.

Sinks.—The kitchen sinks are of a good deal of importance. Manufacturers have tried long and hard to find a material that would wear well. There are a good many people who believe that wooden sinks are the best; there are others who like porcelain; and even a larger number who prefer concrete; slate is the choice

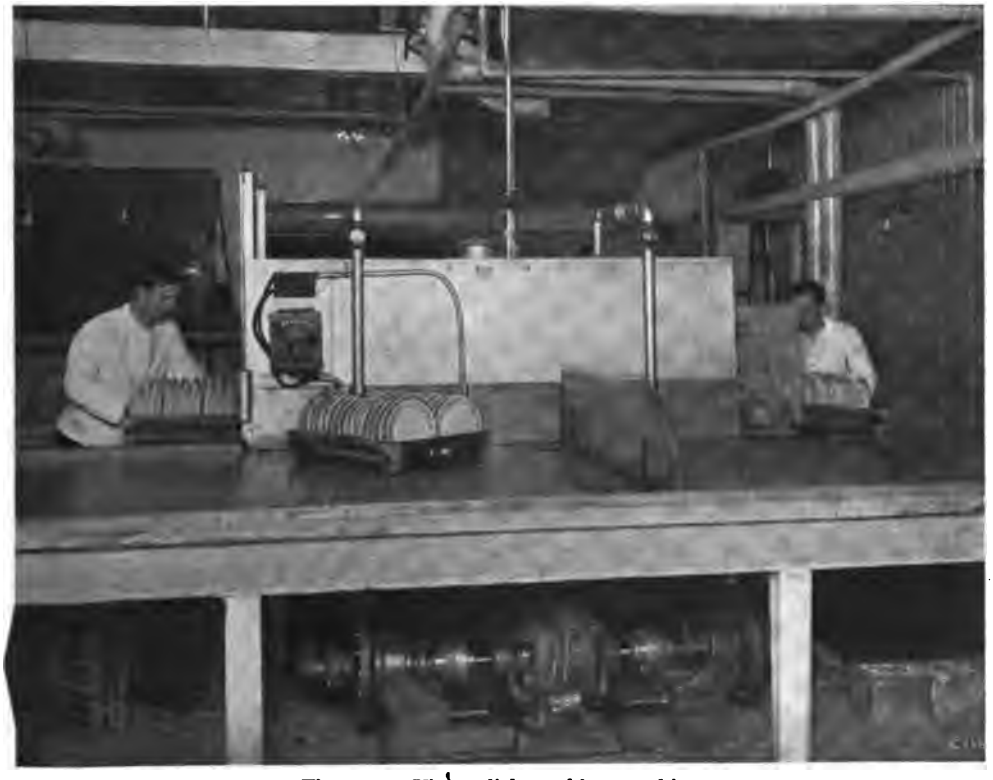


Fig. 132.—Victor dish-washing machine.

of others. These slate slabs should be not less than 1½ inches thick; they can be fitted tightly by rabbitting the bottom with the sides and ends, but slate will not do at all unless it is bound with brass or nickeled brass; slate is not a very hard substance, and, unless it is bound, it soon wears on the edges and chips. There is a softness about slate that will cause fewer broken dishes than with either concrete or porcelain. Sinks made of 2-inch cypress wood, and bound on the edges with brass or even steel, are inexpensive and very durable; if the segments of wood are doweled in and fastened with long bolts they do not warp; moreover, the wood is so soft and springy that dishes sometimes escape destruction when they fall.

Soup-stock Boiler.—One of the most important articles of kitchen equipment is the soup-stock boiler. Several manufacturers are making this article of an

outer and inner case of cast steel with steam coils between, and with a steam release valve that will allow the live steam to permeate the contents. Both these casings are made very heavy, and the steam coils are generally inadequate to provide a sufficient quantity of heat to start the boiling in a reasonable time. A very efficient pattern of this mechanism is that made by the Wrought Iron Range Co., of St. Louis. The inside of the mechanism is a half-globe of polished steel in one piece, with no joints or connections of any sort, and the provision for steam in the jacket is sufficient to start soup-stock boiling in a few minutes after the steam is turned on.

Vegetable Peelers, Meat Cutters, and Bread Slicers.—There are certain labor-saving mechanical devices in the kitchen that will be of interest only in large institutions. One of these is the vegetable peeler. We have had something to say elsewhere about the economics of vegetable peeling. We will now deal only with the

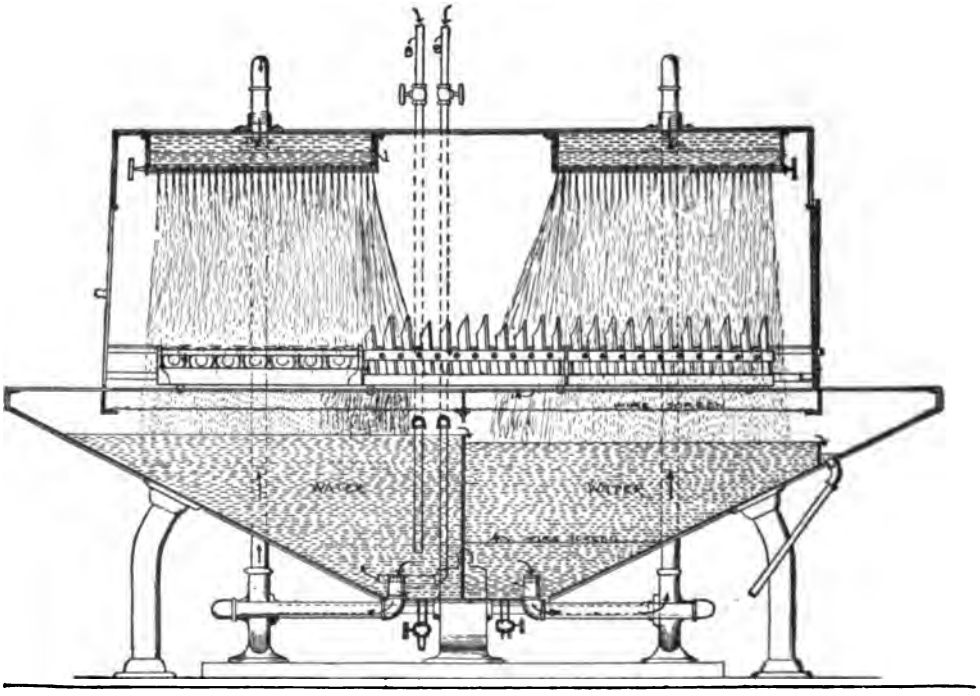


Fig. 133.—Victor dish-washing machine; side view, interior.

devices for doing the work. Potatoes, carrots, and turnips are peeled in the following manner: a quantity, according to the size of the device and the number of people to be fed, is placed in a hopper, which has a lining grater that rotates rapidly, either by motor or from line shaft. A stream of water pours onto the vegetables while they are rotated in the hopper. The work is not evenly done. Sometimes a vegetable will be stuck, so that it doesn't rotate and will be ground away. As a rule, however, the grinding is pretty uniform, though the eyes of the potatoes are not taken out. There are several manufacturers of this device, and each claims for his mechanism all sorts of virtues as to time and economy in operation. Most of these claims are not borne out by the facts, and it may be very safely doubted whether there is much saving, either in time or money, in the present makes of vegetable peelers. The only part of the mechanism that permits of the choice

between the various makes of machine is the grating device. The Franklin Company use a thin metal grater that has to be renewed about once a month, and each renewal costs $6. This machine is, to all intents and purposes, worthless. Other manufacturers use a carborundum grater, that is, fine particles of carborundum fused into a cylinder of cast steel. Carborundum is extremely hard, and the grater is, therefore, very durable. Perhaps the best manufacture of this device is shown in Fig. 134, made by the N. R. Streeter Co., of Rochester, N. Y.

The same company makes a meat slicer, shown in Fig. 135. It has an adjusting device for fixing different cuts of meat. This machine is used more especially for cutting dried beef and bacon. It is rather an expensive machine, but very satisfactory, and it may be safely doubted whether it is not an actual economy,

Fig. 134.—Power peeler with motor stand and guard.

because thin sliced bacon and chipped beef are not only nicer, but since we all eat so much with our eyes it may be safely said that about so many slices of meat will be eaten, whether they are thin or thick, and the thinner they are the farther they will go. The working parts of this device are rather easily cleaned, and it need not give any special trouble.

There is almost nothing to be said about a bread slicer. There are any number of makes on the market, some of them elaborate, made of castings with self-feeding devices, and expensive. Others are made of wood, like a farmer's ordinary feed chopper, and the one that should be used will depend a good deal on the amount of work to be done. The principle thing to consider is the safety of the device. Maids seem to forget about their fingers when they are in a hurry slicing bread, and,

unless the device is "fool-proof," there will be a good many accidents. Figure 136 shows one of these rather elaborately made devices.

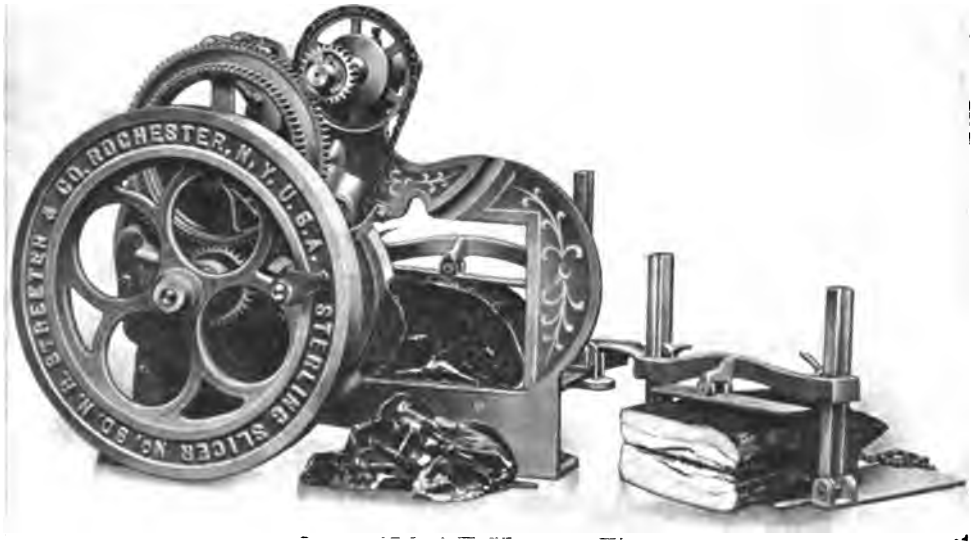


Fig. 135.—Meat slicer.

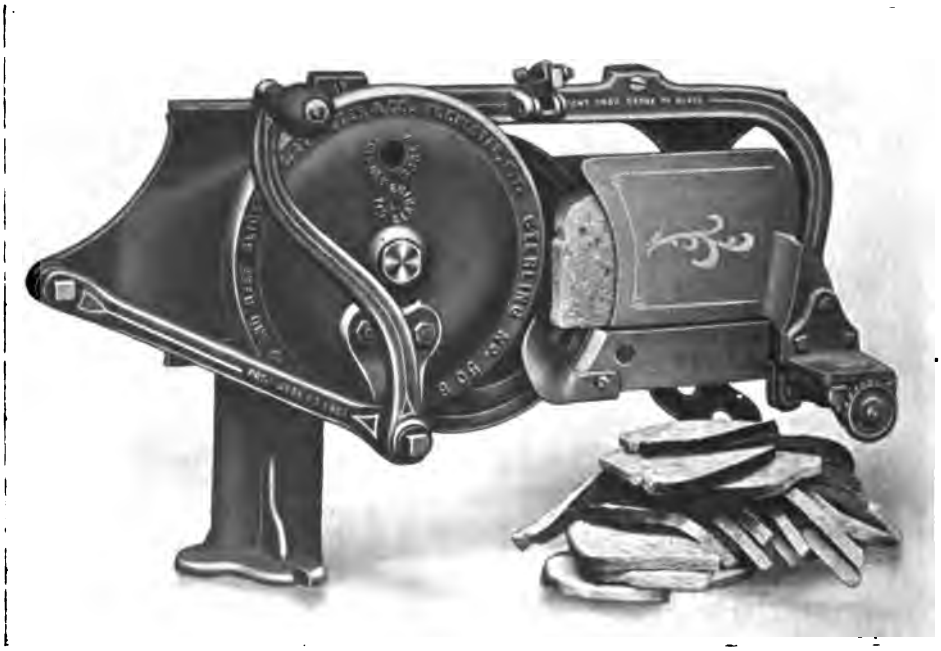


Fig. 136.—Bread slicer.

Vegetable Cooker.—Preliminary to a discussion of mechanism in which to cook vegetables, let us think briefly of the requirements in vegetable cooking and of the

chemic changes that occur when vegetables are cooked. We cook vegetables in one of two ways, either in boiling water or by means of steam, and, usually speaking, we cook vegetables until they are soft. When we cook them in water we do so at a temperature of 212° F., that is, the boiling-point of water, and one of the peculiar physical characteristics of water when it is boiling is to take out of meat or vegetables that are cooking in it certain of their extracts and soluble constituents. If we boil meat long enough in water we remove nearly all of its extracts and nutrient properties—its fats, myocins, and even its taste—so that at the end of four or five hours of boiling one will hardly be able to distinguish between mutton and beef, and we use the water in which this meat is boiled as a soup stock, and expect it to contain practically all the juices formerly held in the meat.

Now, when we boil vegetables in water we perform practically the same office. For instance, with potatoes we not only coagulate the starches, but we remove most of the protein of the potato if it is cooked long enough, and a well-boiled potato, especially if the jacket has been removed, has almost nothing left but starch. The peeling serves to hold these nutrient proteins for a much longer time, but eventually the peel comes off too, and with it the protein zone on the outside. The same may be considered true of beans, peas, corn, asparagus, and even the leaf vegetables, such as spinach, cabbage, and cauliflower.

The ideal way to cook vegetables is in the so-called fireless cooker, but this, of course, cannot be done for a large institution. The most delicious navy beans can be prepared in the Dutch oven, in which the vegetable is practically sealed during the whole process of cooking, and not only the juices, but the taste, is retained. Such a device is not practicable for the large quantities of food used in an institution, but there must be a substitute.

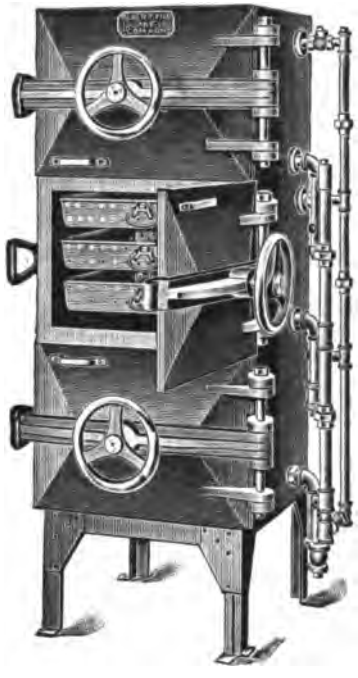


Fig. 137.—"American" vegetable cooker.

Nearly all vegetables, especially when fresh, contain a sufficient amount of water in which to cook themselves, and they need practically only the direct application of heat to prepare them for the table. The best form of heat is steam, a few degrees higher than the boiling-point of water, and, if this is applied carefully, almost no part of the vegetable, not even the taste and odor, need be lost, and all of its chemic virtues as a nutrient retained.

Figure 137 shows rather a new device for cooking vegetables by means of high-temperature steam, applicable to institutions of any sort. It is made by the Boin Steel Range Co., Cleveland. The illustration shows three separate independent cookers; each section measures 18 inches wide, 22½ inches deep, and 9 inches high inside, and each section is provided with a perforated galvanized-iron steam basket. Instead of the basket there is also a removable perforated shelf to fit any of the sections, to cook, for instance, whole potatoes. These sections are made wholly independent of each other, and, instead of three sections to a device, there may be two, or one, or five, as the institution may require. The sections

are made of cast iron, seamless, and each is fitted with a steam-tight door. There are check valves on both vent and drain connections, to prevent the mixing of odors or flavors, and it is a matter of experience to determine just how much steam shall be let in, and to what extent the vent pipe shall be opened, to insure a perfect cooking of the vegetable without loss of its taste and odor or any of its chemic nutrient properties.

In an era that is now rapidly approaching it will be necessary for the dietitian to set on the patient's tray a certain quantity of nutriment that has been previously definitely figured out on a basis of the raw material employed, and when that day comes the dietitian will have to take into consideration all the delicate chemic changes that take place when heat is applied to the article to be cooked. In our present state of ignorance as to the finer chemic changes that occur during the processes of cooking we are wasting much, and depriving the patient of some of the most highly nutritive products that the food article contains. Let us prosecute this thought just one step with a view to illustrate the point. We know, of course, that the human assimilative mechanism can master the animal proteins in meat, and we know that the human digestive process can assimilate such vegetable proteins as occur in the legumes, beans, peas, and lentils, but we know also that wheat bran contains a large quantity of vegetable protein that is utterly useless to the human economy. When the chemist is asked why this is true, he will say that the protein of wheat bran is enveloped in a cellulose insoluble in any of the human gastric juices, and he will tell us that the cow, horse, hog, rabbit, and other of the lower animals can assimilate the proteins of wheat bran because of certain bacterial action that occurs at some point along the alimentary tract, as, for instance, the large cecum in the rabbit, during the activities of which the cellulose envelope is broken down and the protein released for assimilation.

The main purpose in cooking food is to make it more agreeable to the taste, because the cooking process releases many of the chemic constituents; cooking also softens most vegetables and makes them easier to eat; but it is not necessary or desirable to destroy their form, one of the appetizing features of food, nor is it desirable to separate the parts of a vegetable. We must take these things into consideration in cooking, and, therefore, whatever devices we use, they must serve the ulterior purposes, and a slow cooking without water is the best.

Coffee and Tea Urns.—Coffee and tea urns are a makeshift at best, and, as they are built for restaurants, hotels, and institutions, they are merely a concession, and the best substitute in consideration of the great amount of coffee and tea to be prepared.

The ideal way to prepare these beverages is in small individual brewers. For private patients at least tea ought always to be brewed in individual pots; and, in the case of coffee for private patients, a sufficient quantity should be made in a small percolator or coffee-pot, to serve a small number of patients who are to have their meals at the same time, on the same floor, or in the same pavilion, so that the beverage can be served hot and fresh; in no other way is it possible to serve coffee that will be satisfactory to people of refinement and wealth, who are accustomed to properly served things in their own homes.

For private ward and ward patients, and for the well people in the hospital, who are in considerable numbers, it will always be necessary to make both coffee and tea in the large commercial urns installed for the purpose.

There is hardly a choice in the mechanisms offered on the market as coffee and tea urns. They are practically all alike, differing only in workmanship, finish, and strength. The main point about making either coffee or tea in these large

urns is to make it properly and to serve it fresh. Manufacturers generally send printed instructions for the use of the urns they sell, and the details of these instructions are generally questions of taste and individual idiosyncrasy.

There is very much more in the quality of the coffee and tea to be used, and in the brewing, than there is in the mechanism employed. We shall have a good deal to say in regard to the qualities and methods of purchase of coffees and teas when we come to the section on Kitchen Service under the administrative operations of the institution.

An urn for hot water installed between one for tea and one for coffee, with ample protective valves to make them all proof against explosion, will be necessary equipment. There will be much said by manufacturers about the linings and jackets, but there is hardly a choice between the different makes, as they are all built in about the same way and out of the same materials.

THE DIET KITCHEN

Under the section on Operations of the Hospital we shall dwell particularly on the efficiency and completeness of arrangements for transporting food to patients, and we shall likewise discuss the serving of special diets throughout the institution, and the responsibilities attendant on carrying out the doctors' orders in regard to the delivery of the special diets to the patients for whom they are devised, and upon the efficiency of the methods employed will depend the reliability with which an institution can undertake to give special diet. All these things go back fundamentally to the diet kitchen, its arrangement, and its management.

The equipment of the diet kitchen itself is a simple matter. First, it should be close by the general kitchen, because, whatever the plans may be as to the division of work between the two, there will be some dishes, generally the staples, that must be prepared in the general kitchen and taken thence to the diet kitchen for distribution in the form of made-up trays.

The other important element that goes to make up a first-class diet kitchen is plenty of room, because many trays will have to be made up for distribution, no matter how many serving rooms there are in different parts of the house, so that in the diet kitchen there must be plenty of shelf room on which to set trays, and these shelves must be low enough to be convenient, high enough to be easily reached without stooping, and with room enough between them so that the nurses will have freedom of action. Without all these factors the trays will be slovenly and unappetizingly made up.

There must, of course, be a refrigerator, preferably one with several compartments, which need not be large. If ice is used in the refrigerator it may be in the rear, taken in through a rear door or elevator and packed up against the shelving. If the refrigeration is part of a brine plant, the coils may be at the rear and the shelves left free. One of the compartments will be devoted to cream, milk, butter, and cheese; it will not matter if the eggs are also kept there; another may be used for the salads, celery, and the like; a third may be used for the days' meats, and a fourth may be used for keeping cool such prepared dishes as jellies and custards. The supplies used in the diet kitchen will, of course, be kept in the respective refrigerators elsewhere, except from day to day.

It goes without saying that there must be a steam table in the diet kitchen, and this should be large enough to contain not only the cereals to be steamed over night, but it will be necessary to provide steam-table space for whatever staple meats or vegetables or soups are cooked in the general kitchen and brought over for distribution.

There must be at least one range in the diet kitchen, which need not be very large, even though the institution itself be a large one, because most of the roasting is done in the general kitchen, and it will be necessary to devote most of the cooking space on the diet kitchen range to broiling purposes for steaks, chops, and birds, and there must be a toaster also.

It is highly essential that there should be plenty of water, hot and cold, in the kitchen, and the sinks should all be supplied with stoppers at the bottom, so that plenty of water can be had for the washing of spinach, lettuce, and celery, and it will be found convenient to have movable perforated shelving part way across the sinks to contain vegetables while cold water is running over them; the shelving can be made out of white metal or copper, neither of which will corrode easily, or even slatted wood.

Another essential of the diet kitchen is a large framed felt-covered board on one of the walls, on which there are plenty of labeled hooks to segregate and classify the diet slips; and it will serve a most excellent purpose if this menu board is divided off into segments, one for each of the pupil nurses working in the kitchen, so that the dietitian may divide the work among her assistants, just as a copy cutter does the work of a composing room; and if this classification and division and the handling of this board are done systematically, it will mean much in favor of correct methods and reliability in the preparation and serving of special diets. The walls of the diet kitchen, where space will allow, may be decorated with charts, showing the cuts of meats on various animals and their location. By far the best of these charts are prepared by the Pratt Institute, of Brooklyn, and they may be had at a price that barely covers the cost of production.

It is essential that there be a dish warmer in the diet kitchen similar to that we have described for the larger kitchen, and there should also be a large, roomy closet with bins for the keeping of flours and meal, metal receptacles for cloves and spices, and various condiments, and there should be plenty of shelving in this closet for the odds and ends constantly in use. In addition to this closet there should also be one large cupboard, with rack space for pots and pans and the ordinary kitchen utensils. Nothing looks so disorderly and conduces so much to slovenliness as a workshop of any kind in which there is no regular receptacle for things not in use.

In the section on Architecture the conveniences aimed at in the location of the dumb-waiters is treated with sufficient amplitude, so that we need not dwell on this subject at this place.

THE BUTCHER SHOP

The butcher shop is one of the important auxiliaries of the general kitchen, and its equipment is neither a difficult nor complicated one; but having it rightly placed means a tremendous amount in the saving of time and the cleanliness involved in the preparation of the meats. As the kitchen diagram, page 44, will show, the meat refrigerator should be immediately off the butcher shop, and this refrigerator should be long and wide enough to permit the hanging of carcasses on both sides, with a walkway down the center. If the refrigerator is cooled by coil refrigeration, this will be an easy architectural plan; if the refrigerator is cooled by ice carried in, there should be easy access from the outside by a slide or chute, so that the ice may be easily stored in the compartments arranged for it. Even if the institution be a very small one, there should be room enough in the refrigerator to hold a carcass of beef, one or two of mutton, one of veal, and perhaps a hog, with additional room for fowls and birds, and there should also be shelf-room for the keeping of left-over cooked meats. These may be just as well kept in the meat house, as there

is no sanitary reason why they should not be, and it will save having a separate refrigerator for them. Fish, however, should never be kept in the refrigerator in which the meat is hung. The atmosphere of fish is tainted with the odor, and meats kept in the vicinity, even at a very low temperature, will oftentimes carry a disagreeable odor, as well as taste, so that there should be an independent, isolated refrigerator or ice-box for the fish.

Every butcher shop should contain a chopping-block, and the made-up ones are best, because of the difficulty of obtaining good hard-wood chopping blocks without cracks, and four tables, one to contain the beef, mutton, veal, and pork, brought out to be cut up, one for cleaning and dressing fowls, and a third for dressing fish. There should likewise be two sink basins, one for fowls and one for fish. The butcher shop and refrigerator should be well lighted, and both thoroughly drained, so that a hose can be turned in for cleaning them. The floor of the butcher shop should be of concrete or, preferably, some one of the granitoid pavements, which are much smoother and more easily kept clean.

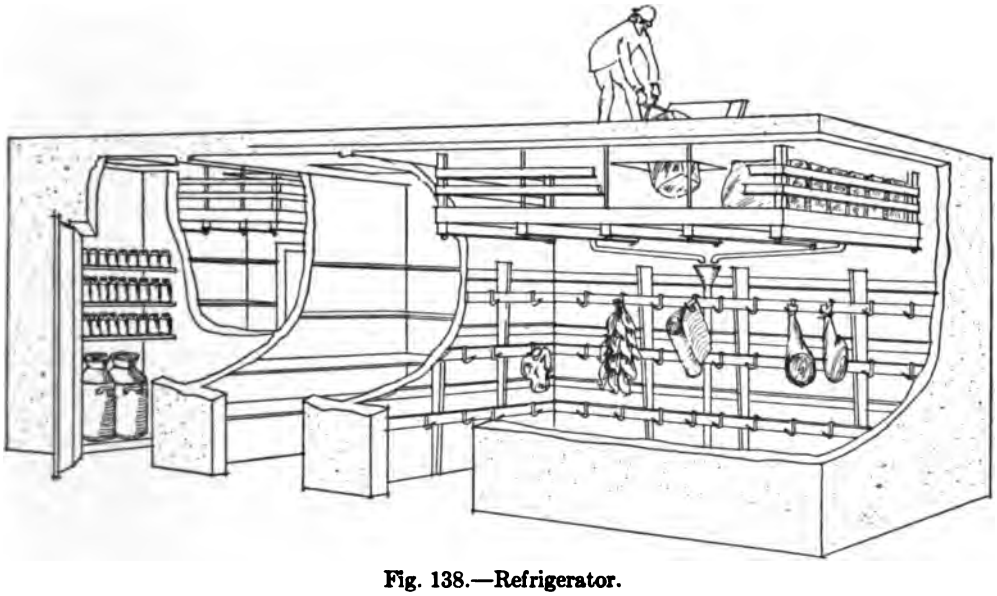


Fig. 138.—Refrigerator.

In connection with the butcher shop there should be a scale, registering to at least 1000 pounds. A cheap scale is not an economy, but may cost a good deal in the course of a year by false weighing, and, if one has a scale known to register correctly, he may feel perfect freedom in checking up the weights of the meat delivery to see that the institution is not short-weighted. If the scale is a poor one, likely to get out of order, the butcher, or storekeeper, or receiving clerk will loose confidence in its reliability, and will presently cease to protest when his weights differ from those of the invoice brought to him, and a curious thing about meat invoices is that they seem never to err advantageously to the institution.

The butcher shop should be large enough to allow at least three or four people to work in it at one time; one may be cleaning fowls, another fish, and the butcher himself may be at his meats. It naturally follows that the ventilation of the butcher shop ought to be good, and it should have plenty of daylight, so that the work people can be comfortable; there is nothing more likely to conduce to shift-

lessness on the part of the employees of an institution than an ill-lighted and ill-ventilated working place, and there is nothing so likely to conduce to cleanliness as plenty of light everywhere.

In the plan for kitchen suite, the fruit and vegetable refrigerators are shown to open only into the butcher shop. There is a definite purpose in this arrangement: where these rooms open independently into the kitchen the help soon get into the habit of stopping as they pass by to purloin an orange or apple, or even a tomato or bunch of radishes, and the loss amounts to a good deal in the course of the year. The butcher or any one person can be clothed with the responsibility of guardianship and held to account, while the goings and comings of many people spell irresponsibility and waste.

If there is no general system of refrigeration, ice, if properly placed, does very well, as, for instance, as shown in Fig. 138. Here the ice is brought from above and through a special doorway, and placed at the roof of the refrigerator.

THE STOREROOMS

The equipment of storerooms for any institution, large or small, is a very simple matter, but the location of these rooms is extremely important, considered from the standpoint of economy in time. It must be understood that the storekeeper is the receiving clerk of the institution, and it will be found best to have him receive and receipt for everything brought to the institution, whether it be a paper of pins or a load of groceries or the coal supply, so that the location of the storerooms is an important matter, if viewed from the standpoint of convenience for the reception of goods, and the storerooms of various sorts ought to be so arranged that they can be reached from the vehicles in which they arrive.

There ought to be a centrally located retail store, the distributing point for the several departments, where small quantities can be expeditiously obtained. This room ought to be very convenient to the kitchen and diet kitchen and to the elevator, so that people from the floors who want goods can get there and back with the least possible waste of time; it must, of course, be equipped with a great amount of shelving, and there ought to be cupboards which can be locked independently of the store itself, for the keeping, for instance, of liquors and wines and other goods likely to attract the cupidity or appetite of the help. These people must constantly visit the storeroom, and if the custodian is out for a moment they will help themselves, if possible. Then there must be drawers for nuts and loose articles of that sort. There should be glass-covered cupboards for the keeping of surplus stocks of valuable cloths. There must be shelving for small quantities of glassware. There must be a great amount of small shelving for the finer canned goods, like French peas and asparagus, or baking powders, spices in original packages, and the like, and there must be a long table in the middle of the room for the cutting of cloth and the setting of packages of all sorts and for the display of samples. In addition to this central or retail grocery store, there must be several separate compartments, perfectly detached for the keeping of various stocks, one for case goods; and, if possible, the china and glassware can be kept in this room. There must be another room, not necessarily a large one, for soaps and scouring powders and janitor's supplies; these goods must not be kept where there are food supplies, especially crackers, cereals, breakfast foods, tea, and coffee, because all of these things absorb odors from the atmosphere easily, and a few boxes of bar soap can soon communicate a soapy taste to large quantities of food supplies. Then it may be necessary to have a cold room, which may or may not be connected with the refrig-

eration of the house for the keeping of surplus fruits. As a rule, fruits are not bought in very large quantities in the summer time, because they do not keep well even in such cold storage as institutions afford, and they are received every day, so that their preservation is a matter of unimportant consideration. But in the winter time considerable quantities of apples, oranges, lemons, grape-fruit and the like will be purchased, and there ought to be a room well separated from everything else, built on the plan of an ice-box with filled walls and filled door, and an opening to the outside air. This opening should be in the shape of a small window, preferably with double frame, so that there will be an air space between the two panes of glass. The temperature of the room can then be very well regulated. If it is at all possible, the stores should be kept in rooms where there are no steam pipes. Basement rooms in a modern building run a very even temperature, winter and summer, and if they are free from artificial heating apparatus, have good ventilation, and a fair amount of light, the usual institution stores will keep very well; if hot pipes must run through them, heavy asbestos-pipe covering can be used, or even two wood coverings, with a small air space between the two layers.

THE PASTRY PANTRY

The pastry pantry should be a well-lighted, well-ventilated room of good size, with plenty of bins for flour and meals, plenty of shelves for fruits and flavors and condiments, and there should be a large center work bench, made preferably 6 inches higher than the ordinary table of 30 inches, because it will be found much easier to work upon a 3-foot table than on a lower one, and the pastry makers are much more likely to be careful in their methods if they are not compelled to stoop over into a back-breaking position. This large table ought to have plenty of cupboards to contain molds, rolling pins, and the ordinary pastry-making utensils. Cook books, special recipes, and the like may be kept on the shelves, or in some special little shelf closet designed for that purpose. Usually the pastry cook will prize these recipes very highly, and, as a rule, will be interested in locking her door when she leaves the pantry if she has them about her work room. The pastry pantry should, of course, have a sink and basin, and should have hot and cold water.

EQUIPMENT OF THE SERVING ROOMS

THE equipment of the serving rooms is a matter of very great importance, because, no matter how direct are our means of transportation from the kitchens to the patient, there must always be in large institutions some half-way station between the kitchen operatives and the nursing department, which must eventually serve the food to the sick in wards and private rooms.

In large institutions the serving rooms will be connected directly with a dumb-waiter, such a one perhaps as is described under the scction on Architecture, using electric signalling and safety devices.

The most important article of furniture in the serving rooms is the steam table. This should be built, not only to retain the heat in articles of food that arrive at the floors in some bulk form for redistribution by the nurses, but it should be arranged for keeping the dishes warm. A refrigerator is necessary, either an ordinary ice-box or one that is brine cooled, such as we described in the section on Architecture. There must be a gas or electric plate for heating things and an adaptable garbage receptacle. There must be plenty of shelving room on which the trays may be set as they are being made up, and if there can be a large table in the middle of the floor with one or two shelves above, it will be a great convenience for the nurses. There must be cupboards with substantial locks for locking up the silverware and food receptacles of various sorts.

Of course, there will be running hot and cold water, and a large sink with drain for dish drying, and if the bottom of the sink has an adjustable stopper, so that it may be partly filled with water during the dish-washing process, it will be a convenience. This sink should be furnished with a strainer at the exit, so that articles of food may be caught.

There is a good deal of choice in the selection of trays for the conveyance of patients' food. Most hospitals use papier mache trays, about 14 by 18 inches in size. They are light and very durable. Some manufacturers are now making a white enamel tray in two or three dimensions, but they must either be made so heavy for purposes of rigidity that they are out of the question, or, if made light enough to be serviceable, they bend, and eventually the enamel comes off, and they are not very inviting. Nickeled metal trays are also used, but these are rather expensive and heavy.

There is made a plate containing a hot-water container underneath that is fairly serviceable, but it can be made to contain only one article of food, and the food dries up quickly, notwithstanding a rather tight-fitting lid that goes with it. It is an expensive plate, and its use is limited.

The author has designed for use in the Michael Reese Hospital an individual hot-water tray, shown in Fig. 139. The mechanism is obvious. The tank is made to contain about a gallon of hot water. The top of the water chamber is of stamped metal, with insets for the small vegetable dishes, and a larger center piece to contain soup. The soup bowl is made of aluminum, as, indeed, the whole tray can be made of that metal. After the hot dishes are set into their proper places a light cover is placed on to prevent the fumes of the contents from wetting the tray itself. The tray acts as a final cover also, and is made to contain the plate, also a cup and saucer,

cutlery, sugar, and creamers, and whatever cold dishes, salads, or desserts may be desired. This tray is heavier than the ordinary tray, because of the addition of

Fig. 139.—Individual hot-water tray.

Fig. 140.—Individual hot-water tray.

hot water, but it is carried down at the nurse's side, where weight is not quite so great a consideration.

Fig. 141.—Food containers.

Sometimes a patient is not ready for the meal, and it will have to wait for a considerable period of time, and in the ordinary trays will be cold and uninviting.

This tray will keep the meal hot for as long as an hour, and the warm vapors are confined, so that the food does not dry out rapidly.

Food Containers.—The subject of containers for the bulk foods, to be distributed to various parts of the house, has been left until we had finished the description of the general and diet kitchens, because these food containers must go from both places under certain conditions, which will be more fully described under the head of "Kitchen Management" in the section on Operation. Figure 141 shows a general form of food container that meets most requirements. These containers are made up, as the illustration shows, of a large pan 12 inches wide, 16 inches long, and 6 or 7 inches deep, with tight-fitting lid. This pan must be strong and, preferably, reinforced with metal bands. Inside of these containers are the food pans themselves. One of these may be large enough to fit very loosely into one-half

Fig. 142.—Food car.

the entire container; another may fit one-quarter of the whole, and there may be two others to occupy the other quarter. If desired, the container may be made large enough so that, instead of holding four food pans, it will hold six or even eight, and when wanted for use all of the food pans may be of the smaller size, or all of the pans may be of the largest size; in other words, interchangeable.

The inside pans should all be larger at the top than at the bottom, and should be just large enough to fit very loosely into the container, so that when the food pans are in place a considerable quantity of hot water may be poured in. Then the lid can be put on, and the food is ready to be taken to the floors, where it is set on the steam tables in the serving rooms about the house, and can be kept hot for any reasonable length of time without fear that it will either dry up or be soaked with water. The metal out of which these food boxes are made is a matter of a good deal of importance. They do not last very well at best, and if they are made

out of the ordinary sheet metal they rust rapidly, and the expense and time involved in the mending of them counts up rapidly, so that they should be well made at first and of a metal that does not rust; copper is preferable, and, if the item of expense involved in polishing the copper vessels is to be considered, the copper may be tinned. After a while this tin coating will wear off, but it may be replaced easily and cheaply. It is useless to make these containers out of so-called tin, which is only a sheet of steel dipped in tin, a coating so thin that it lasts almost no time.

The Food Cars.—In institutions of large size, where food must be distributed over considerable areas to different parts of the building, it is necessary either to have several dumb-waiters starting from different parts of the basement and running to different parts of the upper house, or, if there is only one dumb-waiter, to have food cars for each floor to wheel the food from the dumb-waiter to the several parts of the floor intended to be served; a number of dumb-waiters located in different points, in which most of the transportation of the food can be accomplished in the basement by a corps of help devoted to that service, under a concerted supervision, is best where the architecture will permit. In either case it will be necessary to employ food cars of some sort.

Fig. 143.—Food car.

Some of these offered for sale are noisy and rumble unnecessarily; some of them are so light that they wear out or break easily under the rough usage that they are bound to have; again, some of them are so heavy that when loaded they are difficult to handle; there are others that do not lend themselves to short turns, because the

wheels are too high to work under the body; there are others, apparently all right, that are made with flat wheels covered with tightly drawn belting, or in some cases covered with a woven cloth containing some rubber ingredient that makes them run smoothly and noiselessly, but this covering soon stretches and falls off and is difficult to replace satisfactorily, as the manufacturers rarely keep the material in stock. There are cars whose wheel has a grooved felloe, like automobile or bicycle wheels; this is the car to use, and, as all four wheels are the same size, about 12 inches, and can be replaced if they break or wear out, and the bicycle tires can always be renewed. The wheels are set up on a gearing, the axle of the hind wheels fixed and the front wheels set truck fashion, so that they work each independent of the other under the car and on ball bearings.

The architecture of the car is a matter of individual choice. If the framework, shelving, and supports are of wood, the paint wears off, and the car presents an uncomely appearance; if the structure is metal, enameled or painted, the paint or enamel wears off, but the metal car can at least be kept clean. Figure 142 shows a car that will meet most requirements. It gives no trouble, is noiseless, and, while light, is very strong, owing to the I-beams used for reinforcement.

Another form of car (Fig. 143) contains doors, so that the car can be closed up for transportation of food out of doors or over long distances. The wheel arrangement is the same in the two cars. One has grate shelves and the other solid sheet metal. This is made by the Scanlan Morris Co., of Madison, Wis. There are other cars that are heated, some by electricity from an ordinary lamp socket applied to a plate in the bottom, and others contain reservoirs of hot water. Individual conditions must guide the choice.

EQUIPMENT OF THE SMALL PRIVATE HOSPITAL

THERE are many very excellent physicians, surgeons, general practitioners, and specialists who live in communities too small or too scattered to afford a good general hospital, and a great many of these men are finding their environment unsatisfactory and their facilities to do modern work insufficient. They are banding themselves together, therefore, in many places and are equipping large private homes or modest houses of one sort and another to do at least the commoner things in medicine, surgery, and the specialties.

The question comes up, therefore, What are the necessities for such an equipment—not what would be desirable, but what must be put in with which to just barely get along? This question is placed before hospital administrators almost daily, and, with an apology for a recommendation of anything less than proper modern equipment, we shall undertake to answer that question.

The first necessity, indeed, the only actual necessity, is an efficient sterilizing plant. This can be made up very compactly and set upon a rack made of gas-piping, white enameled. It can contain a hot- and cold-water sterilizer of 8 or 10 gallons capacity each, a utensil sterilizer about 16 inches square, and one or two instrument sterilizers 9 x 16 x 6 inches. They are made now so that an electric current can be used where such a convenience is available, and they are also made with a self-contained generator or small steam boiler. Any of the sterilizer houses will furnish such a plant for approximately $300.

A few rubber sheets, a Kelly pad, or similar device, for dressing patients in bed; a few hot-water bottles, urinals, bed-pans, enema sets, made up of can, tube, and point; a nutritive set or tube, made up of can, tube, points, and funnel; a few sputum cups; a few drinking funnels, basins, pus-basins, and anesthetizing set; either ether masts or oxygen gas outfit—these are practically all the requirements of a private small hospital. Plain three-quarter width white-enameled beds, curled hair mattresses, one hair pillow and two feather pillows for each bed, one or two pairs of blankets, two spreads, and half a dozen sheets and pillow slips will equip the beds; ordinary trays will do for serving meals to patients unless the money is available for bedside tables; an ordinary small table, a dresser, and a rocker compose the furniture for private rooms. There should be a commode or two in the house, and a wheel chair or two, if possible.

The surgical appliances need not be listed. They will be made up to suit the inclination of the individual surgeons who operate. In the section on Equipment of the Operating Suite there will be found a very detailed description of the material for any operating-room, large or small, and the manner of its preparation.

Articles for the comfort of private patients may be bought or improvised, such as back- and head-rests, Morris chairs, and the like.

Carpets nailed to the floor should be tabooed; if the floors are bad, they should be covered with linoleum and small rugs used here and there, and these latter should be made up of home-made stuff, or so-called "rag rugs," that can be boiled and cleaned; they are very cheap.

PART III

OPERATION OF THE HOSPITAL

THE BOARD OF DIRECTORS

If we are to contemplate intelligently the personnel of the board of directors of a public or semipublic institution, and to frame an opinion as to the qualities, social and business, that should be looked for in a member of the board, we must first understand something of the duties of the board.

The board of directors is the hub around which must revolve all the activities of the institution. It is not only the creative, constructive body, but it is the operative body and the executive inspiration of the institution. Its members must be not only alert, active, intelligent members of the community, but they should be people who cover a large field socially, intellectually, and financially.

One of the duties of the board is to buy land and construct a building, and there should be a few members who are familiar with real estate and building enterprises, and the other members of the board ought to be well enough balanced individuals to recognize their inability to cope with these particular problems and to allow of their handling by those who are most competent. Another duty of the board is to appoint executive officers, and there should be at least two or three members who are accustomed to handle people, and to judge of their value and to get work out of them. Another duty of the board is to finance the institution, and there should be two or three members whose business is finance, and who know figures, and who can appreciate balances and make comparisons of value in figures, whether it be goods purchased or work done. Another duty of the board is to secure money with which to operate the institution, and every board of directors should contain in its membership several people who have the utmost confidence of the community, and who can go to individuals and command not only respect, but material support. Another, and perhaps the most important duty of a board of directors, is to give personal attention to the conduct of the institution for which it is to be held responsible. The crying need in directorates of institutions in this country, operated without profit, is for men and women who will take a personal interest. This does not mean that a board of directors should divide itself up into committees to look after the janitors and housework, or to run the training-school, or to tell the members of the medical staff how to treat their patients; too many boards of directors contain just such members, members who have plenty of time on their hands, but very little else to give to the institution; who have little influence in the community, who have less judgment, and who eventually earn the wholesome contempt of those who have to do the real work in the institution—that is, the salaried employees.

The question of whether a board of directors should be made up partly of men and partly of women will depend very much upon individual conditions: first, the

character of the institution; second, the available material out of which to choose the directors. There is no question that every institution, now operated exclusively by men, would be better administered if it had the leavening influence of one or more of the right sort of women; the great trouble is and has been to get the right sort of women. More times than not, when a women is chosen for membership on a board of directors, it is because she or her family has given some money for the construction or support of the institution, and too many times such a woman will feel under an obligation to spend her time watching the expenditure of the money she is supposed to represent. Such an influence will not make for very much good in an institution. On the contrary, it will be hurtful in the extreme. Another woman perhaps may be chosen for her individual activity, her industry in securing gifts for the institution—perhaps of linen or articles of clothing—and such a woman will too often insist upon managing the whole linen department, and upon giving orders to everybody concerned in the distribution and use of the articles which she has had a hand in collecting, and such an influence is not a wholesome one in any institution.

In other words, the best conducted institution of whatever kind will be that in which the members of the board of directors are large and broad men or women, or both, who will insist upon the selection of the right sort of executives; who will, in a practical way, watch the conduct of the institution, to see that its paid officers make the most of their opportunities and facilities; who will be potent in securing material resources, and who will guard its efficiency and modernity; and yet, a board of directors that can and will encourage all of its officers to do their utmost for the common good, that will encourage all the factors in the institution to work in harmony, and with a common helpfulness.

Board members of these institutions are usually prominent members of society; they have many friends who are likewise friends of the institution; they have constant opportunity to test the esteem in which the institution is held; to hear complaints of service, of policy, and even of the medical care patients are receiving. There is no more serious duty of board membership than to give the institution the benefit of such complaints, and of the oftentimes valuable advice accompanying them. The superintendent, if he be worthy of the position he holds, should welcome and profit by such vigilant interest on the part of his board members, and take advantage of every complaint and of every item of advice—not always to follow it perhaps, but to weigh it and give it consideration. The superintendent has no such close touch with the outside world as have his board members, and very often interested people refrain from confiding to him what is on their minds, sometimes because they think he is responsible for the thing complained of, and sometimes because they are not on sufficiently confidential terms with him; in any event, he has a right to all the information his board members can supply, to the end that he may better conditions and give a higher order of administration.

How Created.—The manner of the creation of a board of directors will depend largely upon conditions in individual cases. Naturally, the board of directors will be chosen to represent the people who support the institution by their philanthropy and charity, and that will, at the same time, be representative of the beneficiaries of the institution. As a rule, the institution will be chartered under the law of some state as a "no profit" enterprise. Its charter will give it certain privileges extended to those who put up the money for its support, the privilege of electing a board of directors, and of saying in its constitution how the successors to these members shall be chosen. Generally speaking, boards of directors are chosen for

varying periods. At the creation of the enterprise, for instance, a number of directors will be chosen for one year, a similar number for two years, and others for three or perhaps four years, so that after the first year a certain number of members will fall out, or be obliged to stand for re-election at the hands of the members or stockholders, so to speak, of the corporation.

In some institutions the whole board is chosen annually, a practice that has the disadvantages of changing policies and practices following every annual meeting. There is no consistency or constancy in the operation of such an institution. No one can take the same serious interest in its welfare as where the institution is composed of a board whose policies are definitely fixed, and whose members have definite ideals of a fixed destiny, and whose membership changes so little from year to year that these policies cannot be changed following any single annual election.

Oftentimes the people on the outside are not well informed about the affairs of an institution, and they will sometimes set up for election some member of the community wholly opposed to the policies of the board of directors, and whose campaign for election perhaps is a cry for investigation and upheaval and reversal. It has been known that such a member after election, and after proper study of the institution's policies, welfare, and needs, has changed about utterly, and has become one of the staunchest supporters of the policies of the board. This fact means two things: first, that the public should be always taken into the confidence of the board of directors of a semipublic institution; it should be kept well advised of everything that goes on there; second, it means that every institution interested in the welfare of the community at large, without hope of profit to any individual, should not only have settled policies and definite ideals, but the board should be so constructed that these ideals and policies cannot be subverted or changed over night in obedience to a popular and perhaps unjust cry.

Authority.—The authority of the board of directors should—indeed, must—be absolute, and naturally the board will be always answerable to those who elect it.

But the authority of the board of directors cannot be wisely exercised through individual members on their individual initiative; in other words, the authority of the board cannot be delegated to committees or sub-committees. These are not intended, and should not be used for any such purpose. The president of the board of directors should not only be the spokesman in matters expressing the board's wishes, but he should be the authority of the institution, except when the board is in session, and the president, therefore, must be answerable to the board at all times for his actions and subject to the board's commands. The only officers of a board of directors of a public institution who should have an executive voice are the president, and in his absence the vice-president, and the treasurer—the one to represent the board when it is not in session, and to give orders concerning the material welfare of the institution itself, and the other to guide and guard the institution's finances.

Committees.—The board of directors should be divided into a number of committees in order to facilitate the work that the board has to do, and these committees should be chosen carefully, with special reference to the qualifications of the members for the work the committee has to do. Generally speaking, committees will work through the superintendent of the institution; at least, they should do so, and it should be their duty to help him, with their wisdom and judgment, to a solution of the many problems that must confront him, as it should be his duty and his pleasure to avail himself of their aid and support and experience at every turn. But the jurisdiction of committees should not become executive; in other words, they should have no power to direct or command the superintendent or any other

officer of the institution, and their functions should cease with the power of recommendation, or, at most, their duty will end by calling the matter at hand to the attention of the president, and by reporting it to the whole board at its next meeting.

If it came to pass in any institution that the committees, or the chairman of a committee, or an individual member of a board, had the power to give orders to the superintendent or to the officials of the institution, the work of the institution would at once enter upon a chaotic regime, without head, without guidance or control, and such a superintendent would become at once the play of contending currents, ineffective and vacillating, for fear of offending some dominant factor in the board, and, finally, he would be a conspicuous failure, with perhaps inherent ability to become a distinct success under other conditions.

Meetings of the Board.—A board of directors has no right to dispense with its regular meetings, and one of the chief factors in bringing about dry rot and stagnation in an institution is the failure on the part of the board of directors to meet regularly, to meet frequently, and to have its full membership present at its meetings; one of the most vital forces in a virile, business-like, pushing administration is an active board of directors.

Nothing tends so much to make one lackadaisical, and to cause one to lose interest in an enterprise, as absence from the meetings at which its affairs are discussed. Nothing tends so much to an active interest on the part of the salaried people of an institution as an active and personal interest on the part of the directors. Meetings can be held too often, because the most desirable members for a board of directors are usually busy people, who find it impossible to attend very frequently, so that meetings should not be held so close together that the members cannot find time to attend, and times of meeting ought to be so chosen that the members can attend. In a good many institutions it has been found that Sunday morning, or at least some hour on Sunday, is the best possible time for the meetings of the board of directors of such institutions as we are now discussing. If the sacredness of the Sabbath be offered as a reason why these meetings should not be held on that day, it might be asked, is there any higher or holier duty than participation in the successful management of an institution devoted to the welfare—physical, mental, or moral—of the people of the community, and especially the dependent members?

Womens' Auxiliary Boards.—In some very wisely conducted hospitals, whether the board of directors is made up entirely of men or is a mixed board of men and women, they have added to the governing authority certain auxiliary boards of women, contributors to the funds, wives of trustees, or members of the medical staff, or members of the religious body under whose auspices the hospital is conducted, and these boards operate in a measure as committees, and have at least theoretic charge of certain physical parts of the hospital management. There is a committee, for instance, in charge of the linens and laundry work, a committee in charge of hospital furnishings, a committee to collaborate with the nursing enterprises of the hospital, another visiting committee, and so on along the whole line of physical activities of the hospital.

As a rule, these womens' committees have not the direct charge of their several departments. They cannot, of course, give definite orders, and their function is more or less of an advisory character.

These womens' boards are most excellent adjuncts to the active management of any institution. As a rule, their members are entirely reasonable, and they recognize that there cannot be several directing bodies, and that their office must be an advisory one. And if these womens' auxiliaries are conducted tactfully,

varying periods. At the creation of the enterprise, for instance, a number of directors will be chosen for one year, a similar number for two years, and others for three or perhaps four years, so that after the first year a certain number of members will fall out, or be obliged to stand for re-election at the hands of the members or stockholders, so to speak, of the corporation.

In some institutions the whole board is chosen annually, a practice that has the disadvantages of changing policies and practices following every annual meeting. There is no consistency or constancy in the operation of such an institution. No one can take the same serious interest in its welfare as where the institution is composed of a board whose policies are definitely fixed, and whose members have definite ideals of a fixed destiny, and whose membership changes so little from year to year that these policies cannot be changed following any single annual election.

Oftentimes the people on the outside are not well informed about the affairs of an institution, and they will sometimes set up for election some member of the community wholly opposed to the policies of the board of directors, and whose campaign for election perhaps is a cry for investigation and upheaval and reversal. It has been known that such a member after election, and after proper study of the institution's policies, welfare, and needs, has changed about utterly, and has become one of the staunchest supporters of the policies of the board. This fact means two things: first, that the public should be always taken into the confidence of the board of directors of a semipublic institution; it should be kept well advised of everything that goes on there; second, it means that every institution interested in the welfare of the community at large, without hope of profit to any individual, should not only have settled policies and definite ideals, but the board should be so constructed that these ideals and policies cannot be subverted or changed over night in obedience to a popular and perhaps unjust cry.

Authority.—The authority of the board of directors should—indeed, must—be absolute, and naturally the board will be always answerable to those who elect it.

But the authority of the board of directors cannot be wisely exercised through individual members on their individual initiative; in other words, the authority of the board cannot be delegated to committees or sub-committees. These are not intended, and should not be used for any such purpose. The president of the board of directors should not only be the spokesman in matters expressing the board's wishes, but he should be the authority of the institution, except when the board is in session, and the president, therefore, must be answerable to the board at all times for his actions and subject to the board's commands. The only officers of a board of directors of a public institution who should have an executive voice are the president, and in his absence the vice-president, and the treasurer—the one to represent the board when it is not in session, and to give orders concerning the material welfare of the institution itself, and the other to guide and guard the institution's finances.

Committees.—The board of directors should be divided into a number of committees in order to facilitate the work that the board has to do, and these committees should be chosen carefully, with special reference to the qualifications of the members for the work the committee has to do. Generally speaking, committees will work through the superintendent of the institution; at least, they should do so, and it should be their duty to help him, with their wisdom and judgment, to a solution of the many problems that must confront him, as it should be his duty and his pleasure to avail himself of their aid and support and experience at every turn. But the jurisdiction of committees should not become executive; in other words, they should have no power to direct or command the superintendent or any other

officer of the institution, and their functions should cease with the power of recommendation, or, at most, their duty will end by calling the matter at hand to the attention of the president, and by reporting it to the whole board at its next meeting.

If it came to pass in any institution that the committees, or the chairman of a committee, or an individual member of a board, had the power to give orders to the superintendent or to the officials of the institution, the work of the institution would at once enter upon a chaotic regime, without head, without guidance or control, and such a superintendent would become at once the play of contending currents, ineffective and vacillating, for fear of offending some dominant factor in the board, and, finally, he would be a conspicuous failure, with perhaps inherent ability to become a distinct success under other conditions.

Meetings of the Board.—A board of directors has no right to dispense with its regular meetings, and one of the chief factors in bringing about dry rot and stagnation in an institution is the failure on the part of the board of directors to meet regularly, to meet frequently, and to have its full membership present at its meetings; one of the most vital forces in a virile, business-like, pushing administration is an active board of directors.

Nothing tends so much to make one lackadaisical, and to cause one to lose interest in an enterprise, as absence from the meetings at which its affairs are discussed. Nothing tends so much to an active interest on the part of the salaried people of an institution as an active and personal interest on the part of the directors. Meetings can be held too often, because the most desirable members for a board of directors are usually busy people, who find it impossible to attend very frequently, so that meetings should not be held so close together that the members cannot find time to attend, and times of meeting ought to be so chosen that the members can attend. In a good many institutions it has been found that Sunday morning, or at least some hour on Sunday, is the best possible time for the meetings of the board of directors of such institutions as we are now discussing. If the sacredness of the Sabbath be offered as a reason why these meetings should not be held on that day, it might be asked, is there any higher or holier duty than participation in the successful management of an institution devoted to the welfare—physical, mental, or moral—of the people of the community, and especially the dependent members?

Womens' Auxiliary Boards.—In some very wisely conducted hospitals, whether the board of directors is made up entirely of men or is a mixed board of men and women, they have added to the governing authority certain auxiliary boards of women, contributors to the funds, wives of trustees, or members of the medical staff, or members of the religious body under whose auspices the hospital is conducted, and these boards operate in a measure as committees, and have at least theoretic charge of certain physical parts of the hospital management. There is a committee, for instance, in charge of the linens and laundry work, a committee in charge of hospital furnishings, a committee to collaborate with the nursing enterprises of the hospital, another visiting committee, and so on along the whole line of physical activities of the hospital.

As a rule, these womens' committees have not the direct charge of their several departments. They cannot, of course, give definite orders, and their function is more or less of an advisory character.

These womens' boards are most excellent adjuncts to the active management of any institution. As a rule, their members are entirely reasonable, and they recognize that there cannot be several directing bodies, and that their office must be an advisory one. And if these womens' auxiliaries are conducted tactfully,

both on behalf of their own officers and members and in behalf of the hospital active administration, only good can come out of their activities.

In the first place, these women are made thoroughly informed of the hospital's possibilities and limitations, and they are very likely to become so enthusiastic over their work that they will go out among the public at any time and secure contributions of either money or material, and in a good many hospitals they make up no inconsiderable part of the hospital furnishings, linens, and the like, by their own unaided activities in the way of collections.

Perhaps the best function of all, and the most valuable one from the standpoint of the hospital, is that the members of these womens' auxiliary boards are out on the firing-line, so to speak, to keep peace between the hospital and the public. There was never a hospital created about whose management there was not fault finding from some section of the community. Sometimes such complaints are unjustified, even where the things complained of are true. For instance, there may be a complaint about torn or stained linen, and these women will know definitely, and can explain to the public that while the linens may be torn and stained yet this is due entirely to the financial limitations of the institution, that will not permit them to indulge in better grades of linen or new linen when it is needed. Perhaps there is trouble with the food, and the public is talking about it. Now we all know that patients and patients' friends are very apt to find fault with the food in a hospital. The patients find fault with it because they are sick, and have no appetite in any event, and perhaps they are on a diet, by the doctor's orders, that is repulsive to them, and this is charged up to the institution itself and its management; then we know that in an institution it is impossible to provide food and to serve it exactly as we have it in our own homes, and there is a complaint on that account from the nurses and interns and executive officers. There is also, to be sure, a certain sameness and monotony in the food service of a large institution, and all these things go to the public in the form of complaints, and there is no influence in the community half so strong to stem the tide of fault finding with an institution like a good, strong auxiliary board of women that know the facts, whether they are justified or not. If they are justified, these women are quite capable of making all sorts of a row to change the conditions, and if the complaints are not justified, leave it to them to see that the actual facts are placed before the public in a proper manner, to the relief of the institution.

It has been claimed sometimes that these auxiliary boards of women are meddlesome and officious, and that they are likely to keep things in a ferment and turmoil in the institution. Of course this may be true in individual cases, and probably sometimes will be so, but an exception to the rule is not a sufficient condemnation of a practice, and it is certainly true that these boards of women are perhaps the greatest of all factors in the success of the institution, and if here and there, in an individual case, the women are meddlesome, it seems to many of us who have had a broad experience in this field that a leavening process is achieved by the sanity and reason and common sense of a majority of the members. Personally, the author has found some of his greatest inspirations in the advice and counsel of the level-headed women members of the committee devoted to the institution.

THE SUPERINTENDENT OF THE HOSPITAL

THE superintendent of the hospital is the executive officer of the board of directors—the general manager of the corporation. Standards of hospital administration have been practically revolutionized within the past five or ten years, and the standards of hospital managers have changed within the same time. The man or woman who was a competent hospital director a few years ago may be to-day so far behind the times that the whole institution is out of date.

In the old days, if the hospital manager was economical in his purchase and distribution of supplies, if he kept his house clean, kept the bugs out of the beds, and gave his patients fairly decent food to eat, he was considered an exemplary and illuminating example of a hospital superintendent. To-day the whole aspect is changed. He must not only do these things or know how to direct them, but he is expected to keep abreast of medical and surgical progress, to know what new apparatus of a medical or surgical kind should be bought and used. He must know the laws of asepsis, and at least enough about the character of the communicable diseases to guard not only against their appearance in the institution, but to prevent their spread, by proper isolation and disinfection; and, as these offices are performed under definite and rigid rules and scientific conditions, he must be in touch with medical science in order to perform them. If he does not know the laws of hydrotherapy and the various forms of physical therapy he must, at least, know sufficient about them to select competent workers in those departments and to judge of their qualifications. If he is not a trained dietitian, he must at least be sufficiently well informed on the physiology of digestion, the chemic constituents of food, and the functions of the digestive organs of the body to direct a proper dietary, not only in the main kitchen, but in the special diet department. If the modern superintendent is not an expert in the purchase, testing, analysis, and formulations of infant foods in the milk laboratory, he must at least be sufficiently well informed to see that this work is done properly and under scientific conditions and to appreciate its value.

If the modern superintendent is not a surgeon or internist, or pediatrician or gynecologist or obstetrician, he must at least be sufficiently well informed on all of these subjects to engage in intelligent conference with the members of his medical staff, to help them create rules for the operation of their departments, to equip them with proper apparatus for their work, and to intelligently purchase for them proper current supplies.

How long would the business manager of a mercantile corporation be permitted to occupy his position who did not know how the details of the business were performed, who was not fully conversant with the processes of manufacture of the article in which his corporation dealt, who did not know the intricacies of the business from both its buying and selling side? In these business corporations the proprietors or owners or officers give personal attention to the business, and are generally active in the direction of their affairs; how much more important is it, therefore, that the superintendent of the hospital, who must be the highest active officer, should be one who knows every detail of the institution's activities? The chief business of the hospital is the care and cure of the sick, and every other

function merely involves a detail of this work. And yet there are those who hold that the best hospital administrator is he who can buy supplies best, or he who can keep the cleanest house, or he who can keep the accounts of the institution best.

In view of these thoughts, it must be self-evident that the hospital administrator must be a many-sided, intelligent, versatile man or woman. He or she must know a great many things on a great many subjects. It goes without saying, however, that the hospital superintendent will hardly ever be a specialist, except in his own work; indeed, the very fact of specializing would be a prominent factor in his undoing as a competent hospital administrator.

There are many hospitals in which the superintendent is a member of the medical staff and does part of the professional work. Especially is this true of special hospitals, such as railroad institutions and maternity hospitals, and it is equally true of some of the large public eleemosynary institutions. But it is quite equally true that in almost every case, at least in the larger hospitals, where a superintendent is found peculiarly unfit for the position he holds, he is less of an administrator of the institution than a specialist in some department of the institution work. In other words, scientific specialization in a hospital superintendent is diametrically opposed to an even, intelligent administration of all the departments.

Most of us have heard hospital trustees excuse themselves for having at the head of their institution an incompetent man or woman, by the statement that the institution is small and that they could not afford a higher salaried official. Naturally, the question will be asked whether an inefficient and incompetent superintendent is not an expensive official at any price, and in sequence it naturally follows that if a thoroughly competent superintendent can increase the efficiency of his institution by modern, up-to-date, scientific methods, and improve its economy by careful buying of supplies, by a thorough knowledge of the commodities with which the institution has to deal, then such an efficient officer is cheap at almost any price. The difference between a $1000 superintendent and a $3000 superintendent for even a small institution can be wiped out by an economy or an efficiency in perhaps two or three directions, and if then the more expensive official can be utilized in all the departments of the institution, what a great saving there will be in administration, and what greater efficiency must come from such a policy. If this great difference is to be found in small institutions, that must weigh their dollars and their pounds carefully to see that the one offsets the other, how much greater will be the difference in the administration of large, costly, expensively conducted institutions! The superintendent of a large hospital who draws $3000 per year can easily waste another $3000 by indifferent purchase of supplies, by wastefulness in the use of his commodities; and when we add to this inefficiency on the part of the low-salaried official in the scientific work of the institution we have a comparison that will hardly admit of argument. Most hospital boards of directors are coming to take this view, and it is the rule rather than the exception that hospital superintendents are drawing larger salaries than ever before, and that more is expected of them. The direct consequence of this is that whereas in the old days members of the medical staff were constantly harassing the superintendent of their institution for new things, new apparatus, new methods, nowadays it is the other way about, that the hospital superintendent under the new order of things is suggesting new methods, new apparatus, and is giving new inspiration to the medical staff wholly within the realm of administration.

If the hospital superintendent is to really superintend the activities of the

institution over which he presides, and if those activities are to continue along the present lines of progress and scientific achievement, it seems to be almost a self-evident necessity that he or she must be a person with medical training, not necessarily that he should do any part of the scientific work, but that he should know how it ought to be done, and how to equip the institution with the facilities for doing it. Moreover, if the hospital administrator is to be the actual head of the institution these days, when the open-door policy is becoming general, and if there is to be any sort of supervision of the scientific work of invited physicians, then it would seem even more necessary that the hospital administrator be a person of medical training. Let us take, for instance, a general hospital that has an organized medical staff in the several departments, but, under the policy fixed by the board of directors, invites outside physicians to participate in the activities of the institution: let us suppose that a surgeon in the community, or at least a physician who considers himself a surgeon, asks for the privileges of the surgical-operating department, and has a private patient on whom to operate. The institution has perhaps published the fact that any reputable physician in the community may bring his patients there. It would seem, in such a case, almost impossible to deprive a reputable physician of the privileges of the hospital, and the courtesies of the institution are extended to him and he performs the surgical operation required. At the end of the procedure it is ascertained that the physician not only made an inexcusable blunder in the diagnosis of his case, and perhaps operated unnecessarily, but that he did the operation in such an unworkmanlike manner that his patient became infected and eventually died. In such a case, it goes without saying, the operator ought to be forbidden thereafter to do a surgical operation in that institution, but the surgical members of the staff have a peculiar delicacy in the matter. If they ask that the operator be excluded, it may be suggested that their course is actuated by personal reasons; that they fear the competition of the newcomer. If they approve of his continuing to operate, they can clearly be accused of condoning an offense that means the lives of human beings; so that, no matter what position the existing surgical staff may take, the situation of the members will be a most embarrassing and unpleasant one. But suppose, for instance, the institution has at its head a competent medical administrator, one who is not in active practice, and who has at his command for counsel a corps of medical men quite capable of advising him as to the actual occurrences during the course of the operation we have outlined. No one can accuse the superintendent of interested motives or personal prejudice; if he invites the offending operator into his office and states merely the facts of the case, and then, kindly and courteously, but firmly, informs the operator that because of his unskilful methods he is asked to discontinue operative work in the hospital, no fault in such a case can be found, at least no personal motives can be adjudged. In any event, a hospital presided over by such an administrator will not likely become involved in disreputable professional practices, and it would seem that such a superintendent had not gone too far in protecting his institution and his medical staff, as well as the public at large, from the imposition of unskilful professional work. He will be criticized, of course, but hardly justly.

Relations to the Board of Directors.—The superintendent of the institution being the executive officer of the board of directors, it is his duty to carry out to the best of his ability the wishes and policies and the rules and regulations of those to whom he must look for his orders.

If it is the duty of the superintendent to carry out the orders of his board, it is certain that he cannot divest himself of the additional duty to give to his board and to the institution his best abilities in the way of advice and counsel. He is sup-

posed to be an expert in the management of such an institution, and as such he is expected to know how things should be done, and he should be expected to give the benefit of his knowledge to those by whom he is appointed, by whom he is paid, and to whom he is responsible. If the relationship between the superintendent and the board of directors is to be a pleasant one to all parties, as well as a profitable one to the institution, it goes without saying that there should be the greatest possible frankness and confidence between the board and its superintendent. The members of the board owe it to the superintendent and to the institution to deal fairly with him, to keep back nothing that can help him in his office as administrator. If they find that, according to their judgment, he is falling short of what such an officer ought to be it is their duty to tell him so. If they find that their superintendent is drifting away from the moorings which they have built and to which they wish the institution still to cling, they ought to point out to him the weakness of his position in detail and to insist upon a change.

On the other hand, if the superintendent of an institution is to be happy and comfortable, and is to be efficient and give to the institution the benefit of all the ability he possesses, he is entitled to the confidence of his board of directors and to an appreciation of that confidence when occasion offers. If the superintendent finds, at any time, that he is apparently out of touch with his board, or with a faction of the board, it ought to be his privilege to say so frankly, so that there may come a better understanding, and so that any apparent difficulties may be adjusted.

The question often comes up whether a hospital superintendent ought to attend the meetings of the board of directors. Perhaps that question cannot be answered for individual cases, and it would seem that while a superintendent is new, and while his status with his board of directors is rather unsettled, and while, perhaps, the members wish to feel free to discuss him and his acts without his being present, the superintendent might very well absent himself from meetings of his board, and the invitation for him to be present should certainly come through the board to him, and not vice versa. It would seem that, if a board of directors is to have the greatest possible benefit of the knowledge and judgment of its superintendent, he ought to be present during the discussion of things apropos of hospital administration, so that he may offer a suggestion here and a bit of information there, and certainly, under such conditions, there will come a wiser and safer settlement of problems if the superintendent is taken into the confidence of his board of directors than where the board must act on its own initiative, and without that intimate information that the superintendent of the hospital, always attending to the duties of the institution, could give.

It has been frequently stated by members of a board that they would like to have their superintendent present, but that sometimes they will want to discuss matters with which he is not concerned, or in which he is personally involved, and that, if he is expected to be present continuously, they will not have the privilege of perfect freedom. It would seem that this is a mistaken view. Every sensible hospital administrator must know that at times he is under discussion—his methods, his personality, and his conduct—and it is equally sure that such a man must understand that the board will want to be unembarrassed by his presence while such things are under discussion, so that, if there is that utmost frankness that there ought to be between the board and its executive officer, it should be an easy matter for the president of the board, or any member, to merely hint that the absence of the superintendent is desired; or a member of the board ought to feel free to suggest that he would like to bring up a matter that is rather personal to the super-

intendent, and that he would like to have it discussed by the board, and that, therefore, he would like to request that the superintendent absent himself. If this common ground were definitely understood between the board and the superintendent, it ought to make things very much easier from every view-point. Of course there is the other view, too: the superintendent ought to have the privilege of excusing himself for attendance on any meeting of his board if his duties call him elsewhere, or if it is inconvenient for him to be present, and if there is perfect confidence between the board and its executive officer, such an explanation ought to suffice to free him from any possible thought in the minds of the board that he has some ulterior motive.

Relation of the Superintendent to Attending Men.—If the superintendent of the hospital is the executive officer of the board, and, if the board of directors is responsible for the conduct of the institution in every part, then it naturally follows that the superintendent must be the director of the hospital's affairs in the absence of the board. If there are established rules for the conduct of the medical men in the institution, of course it will be the duty of the superintendent to see that those rules are enforced, as an expression of the policy fixed by the board of directors; in some institutions there are such rules worked out pretty much in detail, and the superintendent of such an institution will have rather easy sailing in keeping the members of the medical profession within the limits of the rules. But such institutions are not the ones that progress the most or diverge into the broadest work. They are rather narrow in their activities, and there is not very much encouragement in iron-clad rules, either for the members of the medical staff or for the superintendent of the hospital, to branch out into new fields of activity and to establish new standards when they constantly feel the confinement of despotic rules.

Most institutions, however, do not have printed rules for the conduct of visiting medical men; medical men resent iron-clad rules. There is an air of subservience in being held within the narrow limits of rules, and where there are no specific rules, but general policies, there is present a constant incentive to the visiting medical men to work out progressive ideas. And it is in such an atmosphere as this that a superintendent will find his best inspirations. He is not the servant of the medical staff or the medical men, nor is he their master. His position is one of responsibility for the care of patients in the institution, no matter who the doctor may happen to be. In other words he is a consultant, so to speak, in every case in the hospital, and his specific duty is to provide the necessary facilities for the doctor in the treatment of the patient—not alone to provide what the doctor wants, but to suggest, if he can, new ideas that are within the reach of the institution and of the presence of which the doctor is perhaps not informed.

The greatest incubus to an ambitious hospital superintendent is subserviency, either to a personality, a faction, or a factor in the administration of the hospital. In the first place he ought to feel that his judgment in any given case is final. There are many institutions in which there is a definite understanding that the board of directors will support its superintendent in any decision he may make; sometimes his decision will not accord with the views of the board of directors, and sometimes he will be wrong without any question, but every principle of discipline would be violated if, after the superintendent had made a decision in a case affecting one or more members of the medical profession, the board of directors were to reverse his decision, so that the wise board will always support its superintendent, right or wrong. If the superintendent should be repeatedly wrong in his decisions, and should make those decisions so binding that his board would have either to decide for him or against him in an uncompromising manner, his position would become

very soon untenable, and he would be guilty of so gross a violation of good diplomacy and tact that the board would have to make him understand that he would either have to decide questions tentatively and put the final decision up to the board, or he would have to be replaced by some one of more tact and judgment. If it became known that a member of the medical staff, or, indeed, if it became known that any factor in the hospital administration could overturn a decision of the superintendent by an appeal to the board of directors, the superintendent's mastery of the affairs of the hospital would be at an end and his usefulness gone.

The wise superintendent, who has the confidence of his board of directors, will naturally also have the confidence of the members of the medical profession and of the public and of the patients, because his inherent qualities, that have given him the confidence of his board, will have brought confidence in other fields, and such a man will naturally maintain that confidence by calm deliberation in his judgment, by fair decisions, and, above all, by a square deal to everybody.

If there is to be harmony between the various factors in the operations of an institution, the superintendent must be the pivot around which that harmonious operation must revolve; and the very key-note in the creation of such harmony will be an established feeling on every hand that there is no favoritism, and that every one at all times is secure in obtaining exact justice. If the medical men feel that one of their number can get about what he wants, and if there are other medical men who feel that there is an element of favoritism in the conduct of the affairs of the hospital at the hands of the superintendent, harmony will be at an end; friction is sure to follow. There will come every-day problems in the medical care of patients, and in the medical and surgical operations of the hospital generally, and nearly always these problems will involve the personal interests of those whom they affect. If the medical men themselves, by way of their staff organization or by way of the personal strength and influence of certain members with members of the board of directors, are compelled to settle their own problems, there will grow up a species of hospital politics, one of the most insidious cancers in an institution, and an evil that will do more harm than almost any other. But suppose, for instance, that there is a superintendent on the ground who has a knowledge of medical ethics, who appreciates the relationship between medical men toward each other and between the medical men and the public, and who can be counted on to make a wise, diplomatic, and judicious disposition of perplexing problems that arise! To-day such a decision may hurt one man, to-morrow it may favor him. At the time the decision is made the person against whom it lies will naturally feel disgruntled, but if the decision has been of such character that he can feel, on sober second thought, after the personal interest phase has disappeared, that the decision has been for the best good of the institution, and consequently for the best good of all, it will not be long before such a superintendent has the entire confidence of everybody, to the end that his decisions will become effective without protest, and then, and then only, can there be considered a harmonious administration of an institution.

Sometimes in the smaller hospitals, where there is an inadequate or incompetent medical service in one or other of the departments, it may become necessary under certain conditions for the superintendent to take a professional part in the care of patients, and such a superintendent's duties will be onerous in the extreme and his difficulties great. His attitude will be that of a competing practitioner, in a sense, attempting to give equal justice to himself and to the members of the staff, his natural competitors. Those of us who have had large experience in institutional work will search the past in vain for an example of an institution where the

superintendent is, at the same time, a part of the medical staff and superintendent of the institution, and whose administration has been harmonious and successful.

The superintendent of any hospital ought to keep in touch with the advances in the medical profession. He ought to know the new discoveries and about the invasion of new fields, and he ought to be well grounded in the fundamental principles of the science, so that in any case that may arise he will be able to discover the difference in a medical attendant between the wheat of practical things and the chaff of an enthusiasm that is not balanced by sound, practical sense.

Almost daily members of the medical profession are appealing to the progressive superintendent of the hospital for new apparatus, or new methods of procedure, or new activities along some scientific line. If the superintendent says "no" on general principles, and continues to say "no," to these constant demands of the profession, his attitude will throw cold water upon many deserving propositions and many deserving features of hospital conduct. On the other hand, if he says "yes" to every proposition, he will shipwreck his administration on the rocks of extravagance. So that, again, he must fall back upon a common-sense and administrative wisdom, coupled with a sound knowledge of what is going on in the medical profession.

There are certain phases of hospital administration in which superintendents must be guided by the greater wisdom, or, rather, the more specialized wisdom of members of the medical profession; and the wise superintendent will divide his responsibilities many times, not with a single confidential adviser or an intimate personal friend in the medical corps, but, as each problem arises, he will divide his responsibilities with the particular member of the medical corps that would seem, from his position, to be the safest guide in that particular direction. It is perhaps a question of isolation in the children's department, and there will be one particular man, perhaps the chief of the pediatric section, whose experience and judgment will be the best in such a case, and the wise superintendent will counsel with such a man and follow his advice. Perhaps it is a case of erysipelas in a surgical patient. The attending surgeon in the case may not be the best judge as to what should be done, because his interest in his own patient may obscure somewhat his judgment as to what would be best for the institution as a whole, but there will be some unprejudiced member of the surgical staff who can think clearly, because disinterestedly, in that particular case. At any rate, before taking any radical action, the superintendent can have the advantage of such advice before proceeding to a course that may work harm in some direction. And so we might carry problems through all the departments of the institution, and find a different adviser for the settlement of each. And if it becomes generally known among the medical men that the superintendent has a habit of seeking the advice of disinterested members from their own number in the settlement of current problems, such knowledge will add to the confidence in the wisdom of the administration of the institution. On the other hand, if it becomes known that the superintendent of the hospital is seeking counsel and taking the advice of one member of the corps, or of one coterie, on all problems that arise, this again will give rise to hospital politics of a most hurtful character, which will have for its end the discrediting of the activities of the superintendent, and the best that can be looked for under such conditions will be an unharmonious conduct of affairs.

It takes courage to administer the affairs of a hospital, and to maintain control, on the part of the superintendent. Where men's interests are involved their activities will be great, and oftentimes they will employ every artifice and every influence that can be brought to bear to succeed in their purposes, and, if the hospital superintendent shows the least weakness under such pressure, his influence will be de-

stroyed; so that he ought to be especially careful in making his decisions, in order that under pressure, and in the face of any opposition, he will be able to maintain his position against a member or the whole medical corps.

Relation of the Superintendent to Interns.—The superintendent of the institution must have absolute control over the interns, and there can be no half-heartedness about such authority, nor can written rules and fixed practices be waived for an instant. These young men are at a period of their lives where they rebel the greatest against constituted authority, and where their judgment is not good enough to be entrusted with discretion. In a hospital where intern services rotate, and where an intern that is serving one attending physician to-day changes, and is under another jurisdiction in three months from now, it naturally follows that it will not be best for the medical men to be entrusted with authority over the interns. Moreover, the medical men are away from the hospital a good deal of the time, and these young men must be entrusted with a great deal of responsibility in the care of patients, and there must be some ever-present absolute authority.

Rules cannot be worked out too much in detail for these young men. It must be definitely stated what they shall do, and when and how; even the details in their home-life in the institution must be specific, and, after all is said, they will be successful or failures, depending on whether they are compelled to obey definite rules. There never was an intern corps the members of which did not break every rule that they could break with impunity. In other words, if they were not punished for a violation of the rules the rules soon become a dead letter. In many institutions the administration has started out on the assumption that the interns are young physicians and men of honor, and, if placed on their honor, they would live up to the highest expectations that could be fixed for them. Those who have had much experience with interns will know that this attitude is an artificial one and that it is not successful. The young men may be gentlemen of the highest moral character, their home training may have been correct and their ideals high, but as a corps, living in an institution, and given for the first time a certain limited authority, glorified by the title of doctor of medicine, and the intern has yet to be born who does not lose his head, become self-opinionated, arrogant, and sometimes even dangerous. So that in every successful hospital where interns are employed the rules for them are iron-clad, and are lived up to, and if this is to be the status of affairs it must come through the superintendent of the institution.

We have had elsewhere a copy of rules for the government of interns, and if the superintendent of the institution shall have seen to it that these young men obey these rules, he will not only get the best service possible out of them, but he will be doing more for them, and for their future careers as medical men, than by any sentimental course of conduct that places them upon an idyllic plane, and that clothes them with a personality and a personnel that they do not yet possess, and will possess only after a vast amount more of experience in buffetings of the world.

Relation of the Superintendent to Nurses.—Whatever opinion the superintendent of a hospital may hold as to the modern training of nurses, or whatever his attitude may be toward the adequacy of modern nursing methods, he has at least a definite duty to the patients in the hospital that are under his care, and that is to see that they are properly nursed, to see that the orders of physicians and house physicians are carried out in a competent, prompt, and efficient manner. When this is done he may invade the realm of speculation as to modern nursing methods, the training that is at the present time prescribed for pupil nurses, and those other academic problems of training-schools. This right of speculation is his as an interested observer of contemporary things, but he will be doing less than his whole

duty unless he insists upon a training that will nurse his patients efficiently. Such training is not being given to nurses at the present time in any school in this country. If they are efficient and skilful with their fingers, understand medical and surgical technic, and are otherwise capable, it is a personal fitness other than one resulting from contemporary training. The attitude of the public toward trained nurses at this time is too well known for this statement to be controverted.

With this arraignment of a somewhat academic character, let us proceed to the actual administration of the average institution where pupil nurses are employed. Complaints of poor nurses, and of irresponsible conduct, and of still more irresponsible statements of nurses to their patients, of injudicious utterances—all these come to the superintendent's office, and his administration is held accountable for these short-comings whether he would evade this responsibility or not. If a pupil nurse makes a mistake that costs a patient's life the reflection is on the hospital, and the community will hold the hospital and its administration responsible for the wrong, and in the public arraignment of such wrong-doing the training-school and the nurse will not be mentioned. So that it is not only the duty, but well within the province of the superintendent to insist on efficient nursing.

It would be a violation of good discipline for the superintendent of any hospital to attempt to deal with the nurses individually. He must make himself effective through the superintendent of the training-school or not at all. All orders should go through the superintendent of the training-school, who should feel that she is responsible for the conduct of her nurses. It goes without saying that the superintendent who happens to see a nurse doing a wrong thing should correct her on the spot, and that he should then follow up this correction by a report to the head of the training-school. Whether such a regime of nursing is successful or not will depend very much upon the relationship between the superintendent of the hospital and the head of the training-school.

It is unfortunate that in many institutions the training-school has arrogated to itself so important a function, that it has come to dominate the administration and to supplant good nursing by a regime of institution politics, in the presence of which good administration and good nursing are both impossible.

Relation to the Business Management.—The superintendent will naturally have charge of the business management of the institution. The board of directors that institutes dual authority in a business manager and a medical director of an institution invites disaster. The business manager of such an institution will naturally look to his own success, which means economy in expenditure. The medical director, on the other hand, will look to the success of his department in a scientific way. He will want to provide good food; he will want to provide adequate surgical supplies, instruments, and apparatus, and whatever medicines, serums, vaccines, and therapeutic agents may be called for in the modern treatment of diseases. If the business manager, who is not a person of medical knowledge, and who is not specially interested in the scientific welfare of the institution, has it in his power to veto a purchase there will be little or no progress in the institution. Methods will look toward economy rather than efficiency. Scientific work will be minimized. In other words, the institution will stand still, and there can be no harmony between two officers whose duties are so antagonistic, and especially if either or both of them happens not to be broad-minded, progressive men. On the other hand, if the superintendent of the institution is charged at once with all the hospital's activities, and held responsible alike for its scientific progress and its financial economies, it will be in his interest to temper his ambitions of a scientific character with his financial limitations.

In a large institution, where the duties of the superintendent are onerous and exacting, there will naturally be an accounting department, and, in a general way, this branch will be charged with the collection of accounts, and with the watching of the expenditures, with the checking of bills and the like, so that the superintendent's duties can be minimized and confined to a general supervision of fiscal affairs, and this is one department in which the superintendent can be greatly aided by that particular member, or that particular committee of the board of directors, charged with the finances of the institution. In other words the superintendent of the hospital must work with the finance committee, and if this is done harmoniously an immense amount of work and worry will be taken from his individual shoulders.

There must be some one who shall have discretionary power in current financial matters, some one who can purchase goods for immediate use, and some one who shall have power to make emergency arrangements with a pay patient in the institution for holding a bill in abeyance, or for making certain deductions in an account, or a certain refund, and naturally this power will fall to the superintendent, subject always, of course, to the supervision and control of the board of directors.

It goes without saying that, if the superintendent is to be charged with the proper administration of the affairs of the institution, he must have power to employ and discharge the help, and this power should be absolute and final for the common help, and he should always have power to suspend any one working in the institution until such time as the board of directors may investigate and make final decision upon the matter.

Relations to Patients and the Public.—The relations of the superintendent of the hospital to patients and the public may be considered as one problem. It is a delicate relationship. His function in the hospital is to give a high order of care to patients, and in doing this he will give the greatest possible amount of satisfaction to the relatives, who may be considered to represent the public. It is the duty of the superintendent to investigate all complaints of patients or their relatives as to abuses in the institution, and to correct these when found. It is the superintendent's duty to meet the relatives of patients and individuals who may be interested in their welfare, and to discuss their anxieties with them, and to help them by his advice in every way possible, and the most delicate of all his duties will be sometimes to adjust the attitude of patients and their friends toward their medical adviser. Oftentimes a complaint will be made to the superintendent of the institution that the patient is not getting proper medical treatment, and there will sometimes be coupled with this complaint a demand for another doctor, or for consultation, and in such contingencies the success or failure of the superintendent to be of assistance to his patient, or his patient's family, will depend very much upon his relation to the members of the medical corps. If he is on such terms with these medical gentlemen that he can go to them in a confidential capacity, and represent the patient, or the patient's friends, in voicing a complaint, he can be of aid both to the physician and the patient. He can sometimes bring about a new stimulus to the physician in the treatment of the patient, and sometimes his consultation with the physician will enable him to assure the patient that he is getting the very highest order of professional service, and, in any event, he can be of infinite service to all concerned.

THE MEDICAL STAFF

THE medical staff is the most important factor in any hospital. Upon it will depend the success or failure of the institution. We may operate every other department of the institution along the most highly developed business lines; we may buy supplies with the greatest possible acumen and judgment; we may employ excellent people and work them to the best possible advantage. Every feature of the operation of the institution, its technic, its specialties, its care of patients, may be of the highest order, but, unless the medical staff is right, the institution will be wrong, because the members of the medical staff are responsible for the care and cure of patients, and, unless their orders are right, patients will not be treated right, and so the institution will be a failure.

Unfortunately there are few instances and few institutions in which the medical staff can be chosen upon a practical basis, and too often policy and politics, social and professional necessity, and, above all, financial necessity, will dictate the creation of the medical staff.

Oftentimes it is the medical men in the community who are the inspiration for the creation of the hospital, and quite as often that inspiration is born of personal ambition, a desire on the part of the medical men to build up an institution that will serve their personal interests. Fortunately, men strong enough in the community to bring such ambitions to a successful issue, by securing sufficient co-operation of the citizens generally, will usually be big enough, and broad enough, and unselfish enough to want the institution successfully conducted, even though their own personal interests must sometimes be set in the background.

It is difficult enough to operate successfully a hospital born of personal ambition, even under the most auspicious conditions. It is impossible to conduct an institution successfully, and that larger success is meant that stands for the greatest good to the greatest number, when the man behind the philanthropy or enterprise would prefer failure of the undertaking, as a whole, to failure of his own personal aims.

Sometimes the inspiration for an institution will come from the citizenship of a community, and the co-operation of the medical men is obtained at a later day. Such an institution promises the broadest success, because it may count on the devoted interest of men who do not expect to gain personally, to the detriment of the institution as a whole.

We may take it as axiomatic that no institution can be bigger, or broader, or more famous than its medical staff, and the two must strive hand in hand for the goal.

The movement for a general hospital begins with the appointment of a board of managers or trustees. The next step is the raising of money to construct and conduct the institution; and the third, the creation of the medical staff. What this medical staff shall be, how organized, and how many shall be appointed, will depend wholly upon the character of the institution and the necessities of the community. Naturally, if the institution is to be one for a special purpose, such as a railroad hospital, or one to care for miners or mill hands, or any class of special workers in a community, the medical staff question will be a simple one, and the surgeon or physician

to the corporation will be the whole medical power, besides being responsible for the business conduct of the institution. In such a case the surgeon for the corporation will have his resident assistants, one of whom will perhaps care for the medical and another for the surgical cases, and others the special departments, such as the eye, the nose and throat, and the genito-urinary department.

If the institution is a large general hospital in a metropolis, the question of a medical staff becomes at once a very complex one and is fraught with many difficulties. Some large contributor may have a protege in medicine, whose interests he desires to forward. If a religious denomination has initiated the movement for the institution, leading members who happen to be medical men will have to be cared for, or the family physician of one or more church trustees must have recognition. Sometimes a corporation which may be powerful in the community, and has no hospital of its own, but whose employees are frequently hurt, will undertake to bear a considerable part of the financial burden of the new institution. An influence of this kind is perhaps the most vicious one that can well be imagined in the creation of a hospital, because the corporation will usually insist upon the employment or appointment of physicians or surgeons of its own choosing, men who can be counted upon to serve its interests, which, however, will nearly always conflict with the best interests of the patients the institution will be called upon to serve. These corporations will demand that, immediately upon the reception of a patient who has been hurt at their works, the physician employed by them, who has been placed on the staff at their instance, shall be called to the case. A physician who has gone far enough to allow himself to be appointed under such conditions will go farther, and do the corporation's further bidding by attempting to force a financial settlement with the patient while he is still in shock, or at least very ill from the results of the hurt. It may be said again with emphasis that such a condition is one of the most vicious features that can arise in connection with a private or semipublic general hospital of the present day. "Ambulance chasers" do not all come in the ambulance with the patient. Some of them arrive later.

Let us now turn to a more attractive phase in the creation of the medical staff, and assume that the board of trustees is inspired by high motives, and for the good of the whole community and for the patients. In such a case, the board will first determine, with the aid of medical men on whom they can rely, the classes of cases to be treated in the institution, the divisions of the institution into departments of medicine, and the probable percentage of the patients, as divided among those departments. Next will be the actual appointment of the members of the staff in these departments, and here enters another question that must be met and settled. Shall there be a definite head, with well-defined powers, in the medical staff, and shall this medical organization direct all the medical work of the hospital, or shall the board of trustees itself, through its executive officer, the superintendent of the institution, direct all the activities of the hospital, medical and otherwise, and shall the members of the medical staff be assigned definite work in definite positions, with the intention that their work be under fixed rules?

It may well be doubted if a hospital's greatest good will be accomplished if the physical management of the institution is entrusted to the members of the medical staff in any degree. It may well be doubted that the staff or its individual members occupy positions to make such domination effective and efficient. The medical man is usually not clothed, in the people's minds, with vast business acumen or great business experience. His activities are professional and scientific, and, if he be successful, his time will usually be most fully employed in work other than superintending the buying of supplies, or hiring of help, or the installing of equip-

ment for a hospital. It would, therefore, seem a better arrangement to appoint, within proper limitations, a given number of medical men to perform the professional work of the institution, their authority to end with their professional service.

As a rule, a good deal of apparatus and equipment are demanded in most of the departments of the hospital. The surgeon will need special apparatus; the medical man, a constantly varying, but expensive dietary; both of them, an abundance of nursing and individual service. The eye man will see his own department the most important in the institution, and its requirements the greatest, and so with all of the other departments of the hospital. So that, if any individual member or a few members of the medical staff are charged with the decision as to the purchase of supplies and the general conduct of the institution, it is likely that those particular men will look after their own special needs, somewhat to the exclusion of departments with which they are not familiar and in which they are not personally interested.

Let us proceed to the appointment of a medical staff. Medical men associated with an institution can generally be divided into three classes: First will be those active, scientific men, virile, ambitious, and in the heyday of their careers, upon whose shoulders the actual work of the institution will fall, who have had large experience, but who have not yet arrived at an age when rest and meditation are required. Second, the older members, men who have already their careers behind them, whose experience has made them sought in consultation, who are perhaps closely allied with the money-giving power of the institution, whose warm sympathies are with it, whose age and busy lives for the past few years have prevented their keeping abreast of the progress of the day. Third, the young men who have perhaps served their internships in the institution, or whose connections are closely allied with it, who are beginning their careers, who have had little experience in actual practice, and whose education so far has been theoretic rather than practical. For working purposes, these classes of medical men ought to be called:

1. The service staff.
2. The consulting staff.
3. The adjunct or auxiliary Staff.

The Service Staff.—Undoubtedly the service staff of the hospital will be composed of the active professional men doing work in it, not those who will have private patients merely, but who will take care of the free patients of the institution. It is assumed that every member of the medical staff will have the right to send patients to any department in the institution, and to treat those patients as he sees fit, although they may naturally and scientifically fall under another departmental classification. If an oculist sees fit to treat a case of fever, the patient being a private one, his right cannot be gainsaid, so far as the institution is concerned.

Three questions lie uppermost in a discussion of the service staff of the hospital. One concerns the method of appointment, the number of men required to do the work, and their relations one to another, and to the administrative forces of the institution.

There are really two methods of selection of a medical staff. One is by direct appointment by the board of trustees, and the other is by some sort of competition. It is only within very recent years that this second process has achieved any prominence, and whether it shall be ultimately successful remains for the future to decide.

About the first method—that is, direct appointment—there is very little to be said. The board of trustees, having decided upon the number of men for each de-

partment in the hospital, proceeds by election, or in any way it may see fit to outline, to fill the various positions. Usually a nominating committee of the board fills in the name of each staff member. When the list has been reviewed by the board, the latter will then proceed to a formal election of the men decided upon.

In filling a vacancy in an already established hospital the method may be the same, excepting that it is a proper courtesy to the medical staff for the board to notify the staff that it has such appointment under consideration, and to ask whether the appointment will meet with the approval of the staff. Medical men are very loathe to interfere in such a case, and, if they do so, it is likely to be because there is some very well-founded doubt as to the fitness of the proposed new member. Nor is there any ethical reason why a board should abide by the wishes of the staff concerning the appointment. In presenting the name, the board ought to ask the staff to confine its consideration to the fitness of the candidate for the position, and the staff should not be allowed to go into and act upon the personal relations of members or a single member to the proposed appointee. Medical men are not free from those personal and professional jealousies that afflict the rest of mankind, and it not infrequently happens that a board, dissatisfied with a department, may wish to strengthen it by the infusion of new blood. The old members may resent the inference that they are no longer satisfying to the board, and in that spirit may persuade the other staff members to side with them and to withhold their recommendation. When a name for appointment is sent to the staff and meets with disapproval, it would seem that the board is entitled to know the reasons; and that, if in the judgment of the board, it is due to some unworthy motive, the man ought to be appointed over the head of the staff. Some medical staffs actually shrivel up from dry rot, for no other reason than that they have been able, from year to year, to go along as they pleased, and without any other incentives than their own convenience and the value of the hospital to them as a personal asset. And it will often happen that the only way to wake the staff up will be to infuse new blood.

Appointment by Competition.—The new way, appointment by competition, is a much mooted method, one open to a good deal of criticism, which, however, if successful, will result in, by all odds, the best working staff for the institution. It will hardly be the one chosen for a private or semiprivate institution, and would seem best fitted for the great charity hospitals in the large cities.

The most illustrious example of this method occurred in the case of the Cook County Hospital at Chicago, not long enough ago to determine its success or failure. Staff service had not been a success. There had been much looseness in method, absence of technic, inattention to duty on the part of the staff members, indifference as to attendance, and a general atmosphere of professional irresponsibility. Interns had been permitted to do much of the work, even major surgery, and many scandals had arisen.

The Board of Cook County Commissioners finally determined, after the question had been discussed at length, not only among themselves and with the ablest medical men in the community, but in the public press and among citizens generally, to attempt to create a staff by competitive examination.

It would not do to require an eminent surgeon, who had been following his branch of the profession for perhaps twenty years, to pass an examination in chemistry, or clinical medicine, or in diseases of the eye, nor would it do to require a medical man to pass an examination in minute anatomy; so it was agreed that there should be a different examination for applicants in the different departments; for instance, the applicants for positions as staff surgeons were examined in surgery,

anatomy, pathology, and physiology, all of these branches coming directly into play in their every-day practice and in their particular branch of the profession. Nor would it do to place these experienced men, of long practice and practical work in the profession, upon the same plane as young men who were just leaving school, because the younger men would have the literature over a wide range at their fingers' ends, but would have had no experience at all in the practical operations of their branch of science. Therefore, it was decided to allow 40 per cent. out of 100 for what was called "experience," including the number of years of hospital experience the applicant had had, his connection with teaching institutions, the original work that he had turned out, and the number of years he had been in practice. Sixty per cent. was then allowed for the technical answers in the written examination.

This method was not satisfactory to the profession at large. The older and more experienced surgeons who had reached prominence in the community hesitated to measure their attainments, either in theory or practice, with their fellows in a contest that might be subject to a good many of the vagaries of luck. The young men protested against this form of appointment because of the tremendous handicap of 40 per cent. given to the older men; but, in spite of the extreme pressure against the method, it was finally carried out. The result was the acquisition of a medical staff of active, earnest, practical, experienced men, ambitious enough to have entered the contest, and ambitious enough to want to achieve something once they were appointed; and the staff so chosen seems to be one of the most successful that has ever been charged with the professional work of a great hospital.

One of the questions incident to this contest concerned the personnel of the examining board. It was settled by the appointment of a board composed of some of the older and most eminent men in the profession, whose lives were full of honors, and whose private practices required so much of their attention that they had neither the time nor inclination to devote additional time to public work, to which they had already given so many years of their lives.

In the hospitals affiliated with or operated in conjunction with a medical school the process of staff building is, of course, different. There the heads of departments in the school will be automatically the service staff members of the hospital; and we might pause here just long enough to suggest that, instead of its being detrimental to patients to be used as clinical material, they will thereby always be the greatest gainers by such use. In the first place, the cases are better worked up and the correct diagnosis more eagerly sought. The medical attendants give more careful attention to patients, because it would be rather embarrassing for a professor to have some bright student or intern "spot" something he had failed to find. So the patient profits to that extent.

Number of Men on Service.—The number of medical men to be distributed through the hospital to do the work will depend on several conditions, the chief of which will be the number of patients in the several services. It is almost an acknowledged assumption that medical men, who are prominent enough to deserve appointment as visiting staff members of a large general hospital, are too busy in their private work to devote more than say two or three hours per day to the institution charity work, and it is the more generous of the men, and certainly the more ambitious of them, who will continue from year to year to give that much time. So that we can safely calculate upon two or three hours per day as the limit of service to be expected from the average member of the staff. Some departments of the hospital will require a good deal more time than others. It is said that a

patient on the medical service cannot be properly gone over for physical examination in less time than an hour. If there is a good intern service in the hospital, one in which the histories are efficiently handled, in which the physical examinations by the senior house staff members are made in a scientific manner, and in which the laboratory work is properly done, the length of time the visiting physician will have to spend will be very materially reduced, and he ought to obtain a very excellent idea of the average case in fifteen or twenty minutes. There will be obscure cases in which he will have to go over the patient time and time again, but even in these cases he may be so puzzled as to request the advice of some member of another department in the hospital, and thus his own time will be shortened by that much. It will be only the new cases in the hospital that will require as much as fifteen or twenty minutes of the attending physician's time. A good many of his cases, if he has an efficient intern service, he will not have to see at all some days, and some of them will require only a sufficient amount of time for him to read the house physician's daily record, and the nurse's notes of temperature, pulse, respiration, feedings, bowel movements, and the like, in all a matter of five minutes. In this way we have a very fair idea of the number of average cases the average physician can take care of in a hospital in the average amount of time that will be accorded the work. We have been contemplating in this connection the medical services of the hospital.

The surgical department will not differ materially as to time occupied, and amount of work to be done, if the proportion of patients is about the same. Most surgeons do not operate every day on service cases, but twice or three times a week, and the average surgeon will spend say three or four hours in the operating-rooms, which will average up about two hours a day for the week. If he has efficient interns, he will rarely need to see his convalescent cases in the wards more than two or three times; if everything goes well, and if the dressing-room service is prompt and efficient, he should not lose much time in looking at the wounds of the cases it is necessary for him to see. His technic will soon have become a second nature in the hospital, and his methods will be followed as a routine practice. So that he will spend about as much time in the hospital as the medical man.

The attending physicians in the children's department will spend about relatively the same amount of time with their patients, assuming the number of patients to be about the same as in the departments which we have already discussed.

The specialties are a vastly different matter. If the hospital is in a metropolis where the school rules are strict about tonsils and adenoids, the nose and throat men may have a good deal of work to do, their cases usually coming to the hospital with a diagnosis already made, and they will not be placed in the attitude of consultants, so they can immediately proceed with their work, and do it promptly.

The neurologist will not have so many cases, in fact, in the average hospital will hardly be called in to see more than one, or at most two, cases per day, and these in a consulting capacity, and will have to go over his patients very thoroughly every time. Whether or not his service shall be a very heavy one will depend not only on the number of patients in the hospital, and the general character, class, sex, nativity and environment of the patients as bearing upon their neuropathic peculiarities; the extent of his service will also depend very largely upon the freedom with which he is consulted by the medical men. This brings into the foreground the attitude of the heads of those respective departments toward each other.

In the diseases of the skin and of the eye the work will often be advisory, and, unless there are very special conditions in the hospital, those services will not be very large, and the visiting men will hardly be called to more than one or two

patients at each visit. Oftentimes they do not visit the hospital regularly at all, because of the infrequency of their calls. In special eye and skin hospitals, of course, the case will be wholly different, and the men will be heads of recognized services; and it will be the same in general hospitals that have special eye and skin departments. The men will have about as much work to do as the other major branches.

These foregoing thoughts will lead us, in a large measure, to a conclusion as to the number of medical men required to do the work in the hospital. The question of actual work to be done, however, is not the only one involved in contemplating the number of men to be appointed in the different services.

Permanent or Occasional Service.—A question of very prime importance to staff members of hospitals everywhere is the continuity of their service. A good many ambitious, energetic, high-class men are connected with more than one institution, it being their purpose to be on service at one or the other institution all the year round. One of the livest topics of discussion and disagreement between boards of trustees and medical staffs of large general hospitals concerns the continued service of the members of the staff throughout the year, and from year to year. Medical men greatly object to being on service for two, three, or six months of the year, and then retire from the service for the balance of the year. They lose touch with the institution if they are on service only a part of the time, unless their private patients in the hospital are many. They forget the special technic of the hospital; they forget the rules of the institution, and they even forget the people, unless they are constantly brought in contact with them. Besides that, they nearly all try to keep up to date in the literature, and they like to have material with which to obtain experience with new methods, new lines of treatment, new surgical operations, so that nearly every medical man of ambition is willing to make a good deal of a sacrifice in the extra time he must give to the institution to take care of the full service all the year round, in order to keep in training, as it were.

From the standpoint of the hospital there are advantages and some disadvantages in this continuity of service of the medical staff. The patient in whose welfare the hospital is deeply interested obtains better treatment, a greater amount of consideration, if a physician who has studied his case from the beginning can be allowed to treat him until the end. To that extent the hospital benefits. The technic of the institution, the methods to be employed by the interns and nurses, will have a greater permanence, and the discipline will be good or lax, in proportion as the service of the medical attendance is permanent or frequently changed.

Again, a great deal of apparatus and many instruments are employed in the institution, each physician having certain notions of his own as to their use. If there are few men on continuous service in the institution, the changes in apparatus, the demands for new apparatus and new instruments, will not be great, and, in proportion as the number of men on service during the year increases, so will the demands for new things, and if the hospital is liberal, and if the rotation of service is frequent, it can well come to pass that the institution will find itself burdened with the expense of these new things, and top-heaviness in the use of a great variety of instruments to perform the same service.

The board of directors being a financial body, charged with the physical administration of the institution, and constantly looking for funds with which to conduct it, and being in a measure dependent on a large number of people through whom to secure these funds, will be interested in having the greatest possible number of physicians devoted to the fortunes of the institution, and hence will lean toward the employment of a large medical staff. Sometimes the board, anxious to secure the co-operation, financial, social, and professional, of a large number of men, will

look about for reasons, additional to the real ones, which may be used as argument in favor of their wishes, and occasionally the members of the medical staff will supply these good arguments, not from any wish to do so, nor from any want of interest, but from lack of competition. If one or two medical men are kept on continual service in the medical department year in and year out, and throughout the year, it is only human that after a while they will become rather careless, slovenly in their work, prone to throw a good many things on the interns, and, "so master so man," the interns and nurses on their part will be likely to become negligent and careless. When such a time comes the institution will have set upon a period of stagnation, and there is only one course to be pursued for a radical cure, that is, the appointment of additional members of the staff, and the division of the service by periods of time with the men who are already there. This course will set up a brisk competition. Each set of visiting men, as they come into service, will be put on their mettle. They will be obliged to do their best, with a snappiness and efficiency that will show up well in comparison with their fellows, and, in the end, such a course will bring a very much better grade of work to the patients and a higher order of scientific care.

If the appointments to the staff are so arranged that all of the men can be on service all the time, it must be kept in mind that no emergency must arise that will not bring the promptest attendance of some staff member.

The skin diseases in the hospital, for instance, may be rare, and the attendance of the member of that service may be very infrequently required, but occasionally that member will be out of the city or incapacitated, for some reason, when he is most urgently needed. To avoid such a contingency there ought to be for each service at least enough men so that one or the other can always be on call. It is an embarrassing thing for a hospital to have to send out for some man not a member of the staff, who has perhaps been refused membership, because the attending physician cannot be reached.

Divisions of Service.—A divided authority can never achieve the best order of service in any direction. In any branch of human endeavor a general is left free to direct the activities of his army. The captain of a ship is given despotic power. This principle ought to prevail in the medical service of the modern hospital. It will not be always in the interest of all the members of the staff, but it will certainly be in the interest of the hospital, and the chief factor we must consider—the patient.

This idea has been growing on the hospital world for several years, and some of the best institutions of the country are already pretty well forward with details of arrangement, looking to an undivided authority in all their medical services. The Massachusetts General Hospital began with the surgical service, and at date of publication of this work had extended the idea to its other primary services, including medicine.

The University of Minnesota is rather unique in this respect. Possessed with practically unlimited money to carry out high ideals, this university and its hospital have developed a detail of arrangement that borders on the ideal. There is one single authority in medicine, another in surgery, and so on through the branches. Each one of these heads has under him two, or in some cases three, associates, and these associates have each two or three assistants, and these, in their turn, are assisted by the senior students in the university in the working up of the cases in the hospital.

As Dr. Washburn of the Massachusetts General Hospital said most aptly in a bronchure, which he published at the time the surgical services of that institution were rearranged under this plan:

"The position of chief-of-service, whether medical or surgical, thus becomes one of the greatest importance. It is a position to be filled by a man of singular capabilities, not necessarily an older man, a great surgeon, an eminent physician or brilliant investigator, but a man who combines the rare qualities of tact, generosity, judgment, breadth, executive ability, and the capacity of discerning and bringing out the best in other men. He should be a man desirous not to develop his service for himself or his own reputation, but to stimulate the highest possible development of the individuals who compose it. He should be an instigator and director of investigation and progress. Such men are hard to find. Upon their judicious selection will depend the success of the present project."

This single authority in the direction of scientific services of the hospital has an infinite number of advantages, and its only disadvantage worth considering is the personal equation—the displacement of those men who are not chosen as the chief—but it seems hardly fair to ask an institution to set aside an admirable arrangement in behalf of its management and its patients to serve the interests of individuals.

Relations Between the Departments.—There is another phase in the divisions of service in a general hospital that ought to be discussed at least briefly. The field of medicine is so vast in this advanced day that many specialties have arisen, and in a general hospital these specialties are assuming an aggressive status, and their devotees are demanding service in the charity wards for themselves. However much we may favor specialties, the fact should never be overlooked that all these specialties ultimately must submerge themselves into one of four or five fundamental departments. For instance, if we take surgery in the broad sense, we cannot afford to recognize as on the same plane with it such special branches as genito-urinary surgery, brain surgery, orthopedic surgery, the nose and throat, the eyes, dental surgery, and so on *ad infinitum*. In the field of internal medicine we would find ourselves in a maze of complexities if we were to recognize as coordinate departments such specialties as the throat and chest, the stomach, the skin. There has arisen even the specialist in tuberculosis. The classic quarrel between the internal medicine man and the neurologist concerning the cause, pathology, and treatment of hundreds of diseases is something even the medical faculty itself avoids.

If then, in a general hospital, we designate as departments medicine, surgery, pediatrics, and obstetrics, we will come nearer hitting the mark than by any longer division. Perhaps gynecology might be added to this list, not because it is a fundamental department, but because the surgery of women has attained so large a growth, occupies so special a field, and requires such special operative training that it must be recognized as having a distinct entity. In some hospitals the practice is, and it would seem properly so, to have every case admitted to one or the other of these primary departments and assigned to the men on service there. If, for instance, it is a surgical case that may subsequently require a surgical operation on the nose or throat, then the general surgeon will transfer the case to that specialty, or, if it is a case of inherited deformity, the case will naturally be transferred to the orthopedist; if a case assigned to the medical service develops upon examination a neurologic aspect, then the medical service man will naturally transfer it to the specialist in that department. But those who have tried to differentiate these cases in the admission room will understand that the attempt is almost foredoomed to failure.

There must be one fundamental, underlying principle in the management of the medical staff in any hospital if there is to be harmony and co-operation, and that

is, that administration must be accomplished under definite and fixed policies, and that the members of the medical staff must live and act under those precepts, and that no member of the medical staff shall have power to give any orders whatever, excepting those that directly appertain to the care of his individual patient. The moment one medical man can give an order concerning the transfer or removal of a patient from one service or one part of the house to another affecting the patient of another physician, there will come friction and disagreement between the individual staff members, and a lack of harmony to mar the smooth operation of the institution. The best method of securing co-operative work of a high order is to have the members of the services enact rules for the government of their several departments. For instance, if there are four members of the surgical staff, it would be in order to have them formulate what they consider to be proper rules for the surgical work of the hospital, including the technic of the operating-rooms, technic of the minor operations, such as venesection, injection of abdominal, subcutaneous, and venous salines, and even still more minor operative procedures, like catheterization, the introduction of the stomach-tube, and the giving of high rectals. All these things are subject to a technic, and the house physicians and nurses should be taught this technic uniformly and without any alternative. No physician, staff member or otherwise, should be allowed to disturb it.

When such a code of rules has been formulated by the members of a service staff, it should be the duty of the administrator of the hospital to go over them with the medical men, pass on them from his own standpoint of administration, and veto any part of them likely to bring disaster or inefficiency or friction anywhere. Some of these rules will be in reality fundamental policies, in so far as they affect the conduct of the staff members themselves, and will be covered in that peculiarly elastic thing known as the medical code of ethics, or in that other and more common form of ethics called courtesy, or, sometimes, the Golden Rule. These rules may be so wide-reaching over all the departments that we can better apply them under other headings, such as rules of technic, rules for interns, rules for nurses, and the like. There are three departments where special rules of this character will not fit the hospital in general—surgery, pediatrics, and obstetrics—and under proper headings elsewhere we have incorporated these, and out of these any one may build a set of rules for almost any part of the institution and to cover any special conditions.

The Consulting Staff.—In most large general hospitals and in many small ones there are a few medical men who have passed the age of their best activity, who have served the institution or the community well in their professional capacity, and on whom it is desirous to confer the highest honors which the institution has to offer. If these men are kept on the service staff they stand in the way of progress in the institution. After a certain age men do not readily adopt new ways, and do not take readily to advances in medicine and surgery. Any institution, therefore, in which the scientific work is dominated by these men must fall behind. It is a wise thing in such cases to create what may be called a "consulting staff," on which the older men are given places as posts of honor. It is the case of "old men for wisdom and young men for war." These positions are not merely emeritus in the sense used by medical schools or educational institutions; they are oftentimes of the very highest order of good to the hospital, and many times profitable to the incumbents, because these men are set upon a pedestal, so to speak, and often called by the younger men in consultation in the service cases in the hospital. Thus others likewise learn to lean on their judgment, and oftentimes men who have never had a large consultation practice before find themselves more advantageously situated in this regard than they had ever hoped to be. The institution, it goes

without saying, benefits by the change because it enlists at once the energies and activities of younger men.

Automatic Retirement for Age.—In some ably conducted hospitals there is a rule by which members of the active or service staff are retired automatically at a prescribed age, precisely in the manner practised in the United States Army and Navy. It is never very gracious to emphasize the old age of those we respect, and when, coupled with an implication that the revered person is past his usefulness, it reaches the acme of cruelty. How much better, therefore, to formulate a rule for general application, to work automatically without personal reference. The end is the same; the harshness of the act is somewhat tempered when we allow one whom the institution has delighted to honor to step gently aside instead of forcing him out. Every one else knows that a man is old before he himself realizes it, and too often he will persist in the performance of a fancied duty, even when all the rest of us know that his service is without value and oftentimes actually harmful.

The Adjunct Staff.—Now, having selected the heads of the several departments, and removed as gracefully as possible the dead timber, are we to allow the busy senior men to do all the work, and determine all the scientific activities in their several departments? It would seem not. First, they are too busy, and have too little time at the disposal of the institution; next, they have in many cases outworn the ambitions of their youth, no longer need the peculiar form of recognition which comes from contributions to the literature of their profession, from their attendance on medical societies, from the institution of new practices, and the invasion and exploitation of new fields. In order, then, to secure the greatest possible amount of scientific work that requires time and ingenuity there must be certain young men attached to the staff—coadjutors, adjuncts, or auxiliary men—who have their careers before them, and need only the opportunity, and possibly a certain amount of direction at the hands of the older men, to obtain results which will redound not only to their own success, but that of the institution as well. Of such there should be a sufficient number so that they can work up and exhaust the material in the shape of patients in the institution. If their labors are directed in right channels, and along lines that will be competitive and stimulating, and especially if their efforts are aided and supplemented by the directors of the laboratory, pathologists, bacteriologists, and physiologic chemists, they will turn out "Arbeits" which will meet almost immediate recognition of every interest concerned.

Relations of the Medical Staff to the Superintendent and the Board of Directors

It should always be understood that the superintendent of the institution is the executive officer of the board of directors. He is not a member of the medical staff, and his functions follow precisely along the lines of the activities of the board of directors. Their privileges are his, their duties are his, and in the absence of the board he is their representative.

Leaving out of the question the terms of employment, the medical staff is an operating department of the institution, and its members must always be considered employees under the board of directors, no matter what the terms of contract, the limitations of the agreement, or the personnel of the medical men employed. The argument is that the board of directors, charged with the duty of taking care of patients in an institution, has made arrangements with certain medical men to perform certain duties for a certain consideration, and, where a definite term of appointment is named in the creation of the medical staff, this term of employment

may be considered a time contract made by the board of directors with an employee. To be sure, there is usually no money consideration in this contract, and, generally speaking, the terms of employment are about as follows:

The board of directors, party of the first part, employs Dr. Blank, party of the second part, to treat the patients in the institution, and to do whatever work is necessary to that end, the consideration being that the doctor has been given an appointment that has brought with it high prestige, much honor, a position in his profession that will bring him a larger share of public patronage than he could otherwise have obtained, and a much wider range of experience than he could have had if he had not been connected with the institution. We have in this sort of an agreement the actual employment of the doctor and the consideration he is to receive. Carrying this commercial figure a step farther, we have in the superintendent of the institution the general manager of the corporation, through whom all policies of the board of directors are executed and through whom all orders issue, so that naturally it transpires that the members of the medical staff must transact their business with him, and more or less under his jurisdiction and direction.

The medical staff ought to be able to look to the superintendent for the prompt and efficient transaction of whatever business may be required, and, if he is fully awake to his exact status, he should be of an immense amount of help to the medical staff and never a hindrance in their work.

It may be seriously doubted if there should be written or printed rules for the government of the medical staff in an institution. If there are reasonable, rigid rules for the house staff, for the nurses, precise regulations covering the status of patients in the institution, and a fairly detailed printed technic for the operation of the various departments, instigated by the medical men in those departments, the question of rules governing the conduct of the visiting staff will be a negligible one. It will be found easy and pleasant, by reversing the position of members of the medical staff, and by making them a part of the administrative force of the institution, each member with his own responsibility, to see that all rules of the institution are being carried out. In this way the members of the medical staff are made the rule-making power, and a part of the rule-enforcing machinery, rather than the objects of that machinery. For instance, let us say there is a rule providing that the junior intern is to write the history of his cases within twelve hours after the admission of the patient; it will not be obeyed unless the attending physician on that service demands its enforcement as a part of the administration.

Relation of the Medical Staff to the House Staff

The policy of making the medical staff a part of the administrative force of the institution brings us to the relationship between the visiting, or attending staff, and the house staff of the institution. Stated bluntly, it is that of master workman and apprentice.

The visiting staff does not appoint the house staff, does not prescribe the rules for the government of the house staff, and the two bodies are present wholly as fellow employees under the board of directors.

Generally, the members of the house staff are not paid in money for their service; the board of directors rather undertaking to give these young men a certain experience in their profession in consideration of their labors in the care of patients; and, tacitly, it is understood that acting for the board of directors in this special undertaking the members of the medical staff are committed to the duty of instructing these young men in the performance of their professional duties.

The attending physician must, therefore, see that these young men carry out orders promptly, efficiently, and conscientiously; and, in the event of their failing to obey their superiors in this way, the attending physician must report their dereliction to the executive officer of the institution, in order that the proper discipline be maintained.

Let it be understood that these young men are almost as unfamiliar with their duties of citizenship as they are with the practice of their profession. They have not yet learned a correct bearing toward patients, toward nurses, and toward the public, and the staff member has not performed his whole duty by his apprentice unless the lessons that he teaches go beyond mere medical service, and enter upon the domain of ethics in all its branches.

Egotism and self-importance are the legacies of youth, and these breed impatience of counsel, a disposition to override authority, heedlessness of advice, and sometimes bad temper and impatient personal conduct. It would seem to be one of the self-appointed tasks of the attending physician in an institution to help these young men overcome these inherent weaknesses. Just how this task shall be performed must be left to the individual member of the medical staff and of the house staff—sometimes by good advice, calm counsel, sometimes by proper, dignified rebuke, which we may be pardoned for calling a "dressing down," but every "dressing down" should carry its permanent lesson.

Medical schools of the day, be they efficient or inefficient, stop short of teaching students the details of their profession, such as the bedside care of patients, whether it be the physical handling of the patient, scientific physical diagnosis, clinical pathology, or what not, and only too commonly the visiting staff expects these young men to come from a school desk into an immediately efficient hospital service. They have in their minds merely some vaguely understood theories of medical science, fragmentary bits of theoretic knowledge, and their very presence in the hospital as interns is an acknowledgment of their inexperience and their desire to learn; therefore, members of the visiting staff ought to be patient and painstaking as teachers.

It is a fact, however, that many of the schools, and some of the very best, are turning out young men and women who are not only not at all fitted for their profession, but who can never be made so. It is the duty of the medical staff members to detect this unfitness in its incipiency, and to insist upon the withdrawal of the incompetent from the position of responsibility in the institution, even if they are not able to effect his withdrawal from the profession itself.

Relations of the Medical Staff to the Nursing Corps.

What has been said above can almost be duplicated in this place. Unfortunately, a vast majority of the young women who apply for admission to training-schools are undereducated, both in book learning and in worldly experience. Most of these young women come from the rural districts; they have been reared almost within touch of the mother's apron strings; they have never rubbed elbows with the world or mixed with people; therefore are not only ignorant, in the broader sense, but are likewise without rules of personal conduct. In other words, they are little more than children. Nurses come into the training-school from country homes, with their canvas bags in their hands, who could not give an intelligent answer to the simplest question because of their embarrassment; some of them are afraid of the elevator; some are afraid to sleep alone in their rooms. Imagine, then, this sort of girl set to work upon a writhing, bloody patient, and wonder, if you need, why she does

not make good! We are all familiar with the old story of the nurse who was placed at the patient's bedside and told to watch for hemorrhage, and who watched for hemorrhage until the patient had bled to death, without knowing enough to call for help. We have seen this same girl, and watched her week after week, month after month, year after year, and have seen her unfold and develop, and have seen her become veritably a nursing machine under the guidance of efficient, careful teachers; we have seen this same sort of girl devoted to the point of utter unselfishness; we have seen her step to her duty amid loathesome infections without the slightest regard for self, and we have been overjoyed at the development of character and efficiency in these unlettered, unlearned, ignorant country girls, and have wondered if, after all, they were not the stuff of which to make trained nurses.

And we have seen that other girl, educated at finishing schools, reared in the lap of luxury, kissed always by a kind fortune, bathed in the sunshine of prosperity; have seen her forsake her automobile, her beaux, her pretty clothes and her jewelry, and don the nurse's garb, and succeed in every call of her duty; and we have wondered whether this was not the stuff of which trained nurses are made.

So it seems the girl from the humble home in the country, and the girl from the palace in town, can be molded and developed to do her duty as a trained nurse, to give efficient, prompt, conscientious care to the sick, and we have conceived, after all these experiences, a firm conviction that the trained nurse is the girl of her training, and that as her training has been so will she be as a trained nurse.

And thus we come to the relationship of the medical staff to the trained nurse, and the part the medical man must play in that training. Patience, care, the telling over and over and over again of the way to do things, the showing of the way, practical illustration, bedside help—these would seem to promise more in the field of education of nurses than a rigid discipline, fault-finding censure for mistakes, holding of the reins against innocent pleasures and pastimes. If, moreover, the attending physicians in the institution will help train the pupil nurses in this way, their reward will come when these same nurses are graduated and sent into the homes to take care of their private cases; for there they will show their efficiency and devotion, or they will show the want of training, for which the physician is in no small measure responsible.

The Open-door Policy

Most hospitals of the present time receive not only the private patients of the members of their regular medical staffs, but also those of outside physicians who have no connection with the institution. The exceptions to this rule are the large charity hospitals in which no private patients are cared for, such special hospitals as are operated by corporations in the interest of their employees, and a few private institutions owned by one or more physicians. There are hardly any private or semipublic hospitals which do not accept the patients of outside physicians. These hospitals are known as open-door hospitals. Many features of the open-door policy are subject to serious criticism, and again it has many advantages.

Most physicians living in communities populous enough to afford more than one hospital are usually connected more or less intimately with one or the other, and will naturally prefer to send their private patients there; but most sick people, classed as private patients, also have some hospital connection or are attached for one reason or another to some particular institution. Usually when a private patient desires to go to some hospital to which the physician is not attached his wishes will be respected, and he will be taken where he wishes to go. It may not

be always wise for the patient to choose a hospital with which the physician is not acquainted, because every medical man can get a better service, at least one with which he is more familiar, in the hospital where most of his work is done.

It is not a very difficult matter for the management of one institution to classify professionally the physicians in the community who are attached to some other hospital, to ascertain their abilities, shortcomings, and peculiarities; but there are some medical men who do not belong to any hospital, and who wander about from one institution to another, sometimes from an unsatisfied desire to secure a better hospital service for their patients, sometimes because their peculiarities or their mediocrity has rendered them *personae non gratae* wherever they have gone, and they have not been made welcome and content.

This open-door hospital policy has been rather a free and easy one until within recent years, but it has now risen, or is rapidly rising, to the dignity of a very distinct ethics, and the more responsible and progressive institutions are facing the necessity of enacting some very radical restrictions.

In most hospitals the technical training of interns and nurses, and, indeed, the whole hospital entourage, has come to be one of the most important features of the institution practice, and, if there is to be a regular technical routine practice as laid down by the responsible medical heads of the several departments, no outsider may come and lightly set these well-established practices aside. Whoever comes into a hospital to which he is not attached must inevitably do his work under a technic with which he is not familiar. For this reason, most of the prominent surgeons, and more especially obstetricians, whose work is done usually under exacting conditions, refuse to operate in institutions other than their own. The time seems to be very rapidly approaching when every physician will have to be definitely connected with some one institution and do all his work there; and, at a day not far distant, no institution of standing and responsibility will allow a member of its medical staff to be connected with any other institution. This will mean a tremendous step in hospital progress, and will speak immeasurably for the advantage, not only of the physician and the hospital, but for the patient's best good.

Some very important ethical points must be met fairly and settled equitably. In the first place, it has come to be a very common feeling of members of the medical profession that they cannot take a private patient to a hospital not their own without fear of his being taken away from them by some factor in the hospital administration, and turned over bodily to a member of the medical staff of the institution. The interns and nurses are usually implicated in this habit of "case stealing" in some hospitals. It should be a well-recognized rule of every hospital, large or small, that no physician may ever have his patient alienated by any act on the part of the hospital administration or any one who works there.

Dr. Jones sends his patient to a hospital with which he has no connection, and in which he is not acquainted, and he proposes to perform a surgical operation upon the patient; a few days' time will be necessary, perhaps, for the patient to be properly prepared; presently a nurse or intern will drop some light remark within the patient's hearing that Dr. Smith's patient, a Mrs. So-and-So, is going home to-day; she was operated upon last week for precisely the same disease that Dr. Jones' patient has; indeed, it is truly remarkable how many of these cases Dr. Smith has operated upon successfully and not one of them had died.

"How about Dr. Jones?" the patient in bed will ask; "isn't he a good surgeon?"

"Oh, I wouldn't for the world say anything against Dr. Jones," the nurse will reply. "He is probably an excellent surgeon, but of course we do not know him, and we do know that Dr. Smith has had hundreds of these cases," and the nurse

will probably mention any number of cases that have been recently in the hospital, and have been operated upon for this same disease by Dr. Smith, and that have recovered in almost no time and have gone home permanently cured.

The patient will probably not say very much more on the subject, but as she lies in bed in the dark of the night, thinking about the hazards of the operation she is about to undergo, it is almost a moral certainty that by morning she has concluded that if Dr. Smith has been so eminently successful in this particular line of work, and that if Dr. Jones is not known at all for his work in this direction, it stands to reason that she ought to have Dr. Smith do the operation upon her, and Dr. Jones will lose the case and Dr. Smith will do the operation.

Again, members of medical staffs of most institutions are rather inimic to outside physicians. They are not very gracious about welcoming them, and sometimes go so far as to render their work difficult and their positions uncomfortable. Oftentimes this attitude of the medical staff takes on the dignity of an actual hospital atmosphere against outsiders, so much so that the interns and nurses, unless closely watched, will give as little service and as poor a service to the outsider as they dare. Sometimes there is a show of reason for this feeling of hostility on the part of the interns and nurses; most of these young people are trained by the members of the medical staff, and naturally are taught that the technic and the routine procedures of their teachers are really text-book practices, and that no other technic is proper or legitimate. The encouragement of this feeling is not altogether wrong, because interns—and more especially nurses—are more or less creatures of habit and training, and, unless instructed that there is only one right way to do a thing, are pretty apt to think that almost any way will do; hence the necessity of a distinct technic. It follows, therefore, that when some outside physician comes in and proposes a line of procedure wholly at variance with what these young people have been taught, they naturally are not very much impressed with the ability and learning of the outsider, no matter how he may measure up in the profession at large.

Then, very often, these young people, especially in the larger, more progressive institutions in the centers of population, are pretty good judges of what constitutes proper technic and proper procedure. The interns in these institutions are from the best schools, and usually the best men from those schools. Where this is the case, the position of the outside medical man of mediocrity is a very difficult one.

In the medical departments of the hospital, and in those other sections of the institution where promptness and instant action are not quite so important, it does not matter quite so much if a mediocre or poorly informed medical man has a private case for treatment, because it will not take the administration very many days to learn whether the doctor is giving his patient adequate attention. But in the departments of surgery and obstetrics, and such specialties as the eye, the ear, nose, and throat, where a single act or an instant's delay may mean success or failure, the case is vastly different. It would seem to be the duty of the hospital administrator to know his man well, or for some member of the staff to know him, before an outside physician is allowed to engage the operating-rooms or to bring an operative patient into the institution. It makes very little difference to the outside layman whether or not the doctor is a member of the staff so long as he is permitted to operate in the institution; and the public generally will measure the class of work done in the institution, not by that of its strongest staff member, but by that of the weakest outsider allowed to operate there.

It is a difficult matter to open just a crack of the door of the hospital to the outside physician, or to open it to the physician and keep it closed to the surgeon or obstetrician; but the time seems to be very rapidly approaching when this will have

to be done. Most hospital administrators will recall instances within their own institutions where patients have selected the doctor wholly by reason of the fact that he was reputed to be a regular operator in that hospital, and were not aware that he was merely there as an outsider when he chose to bring a private patient. They have judged the doctor by the institution, and no institution can afford even passively to submit and to allow such judgment to prevail; assuming all this time, of course, that the medical staff of the institution is composed of the best men in the community.

In the establishment of the open-door policy in an institution some very definite rules should be laid down for the conduct of outside men who bring their patients there; rules relating largely to the duties of the administrator of the hospital under such conditions. If, for instance, a physician brings a medical case to the hospital, and persists in a flagrantly wrong diagnosis and a bad course of treatment, according to the standards of the institution, as judged by the laboratory men and house physicians, it would seem to be the immediate duty of the superintendent of the hospital to call the attention of the physician to the view-point of the institution in regard to the conduct of his case, and to insist upon a consultation with some physician in whom the institution has confidence. The superintendent would naturally allow the physician a wide choice of consultants, without even a hint that the consultant should be a member of his own medical staff, because that would look as though there were an attempt to take the case from the physician who had brought it there in the interest of a member of the hospital medical staff.

This duty is a most delicate one. In the first place, who is competent to say that the case has been mismanaged? The superintendent himself has not seen it, and, even if he has, he is not in active practice, and is, therefore, not competent, at least theoretically, to pass upon the merits of a case open to discussion in the matter of diagnosis. No member of the regular staff has seen it, and if he has, he has been guilty of the grossest violation of the very fundamental principle of professional ethics in visiting and examining the patient of another physician without his consent, and in no case could the superintendent use information obtained in that way. Is it a house physician or an intern who has brought the case to the attention of the office? Who has set these young men up as critics of their elders? They are only beginners themselves. Sometimes reliable information can come by way of the laboratory of pathology, where the technical findings in the case will be so contradictory of the clinical diagnosis as to justify complaint on the part of the hospital administration. Sometimes the matter may be delicately brought up in some such way as occurred not long since in a large hospital, to which a patient had been admitted to the service of an outside physician with a diagnosis of appendicitis. The operating-room had been ordered for an emergency operation. The patient was admitted at two o'clock and the hour for operation set at four. When the intern approached the bedside for the routine history, he was so impressed with the condition of the patient that he at once reported the case to his senior, and together they made a clear diagnosis of pneumonia, with manifestations pointing somewhat toward appendicitis.

When the physician arrived, just before time for the operation, he was asked to see the superintendent before going upstairs, and the following very brief dialogue took place:

"Doctor, I am obliged to inform you that your patient seems to have developed a pneumonia since you saw her, and I have taken the liberty to cancel your operation; of course, I knew you would not want to operate on a patient in that condition."

"I am surprised at the turn," replied the physician, "but, if that is the case, of course I would not want to operate."

As a matter of fact, the patient had a well-developed second stage of pneumonia at the time, ran a typical course, and got well. The physician's feelings were respected, his patient protected, and the incident closed in the friendliest way.

If the patient is brought by an outside physician to one of the operating departments of the hospital there should be well-defined limitations and definite rules laid down for the conduct of members of the medical profession, whether they be of the medical staff or not, so that there will be a feeling that all physicians are being treated alike. If it is the surgical department, the rules of technic and asepsis should be pointed out to the newcomer, and he should be courteously informed that there is no departure from these rules. This would include the method of cleaning up for an operation, the wearing of gloves, and the asepsis generally, but he should of course be allowed the widest latitude in the professional treatment of his patient. If the operator is not well known as a surgeon, he should have the services of the best house surgeons or senior interns to assist him, and if they are capable men, and if there is an efficient nursing corps, the inexperienced operator will not be likely to go very far wrong before his assistants ascertain his incapability, and give him a sufficient amount of help, courteously offered, to bring the operation to a successful issue.

After the first operation the hospital administrator will have no difficulty in securing information as to whether or not the operator ought to be invited to continue surgery in the institution, and if not, the visitor should be politely informed that his discontinuance would be appreciated.

It is in the obstetric department of the institution where the most harm can be done in the least possible time by an inexperienced man. In surgery the operator sets out to perform a definite operation under classical rules, well understood by the house staff, and any departure from these narrow limitations as to how an operation should be performed will be recognized almost immediately, and the attention of the operator called to the fact. In the obstetric department, however, the case is vastly different; there is no infallible rule when forceps should be applied that will fit all cases; there is no definite instant at which labor should be immediately induced that can be universally applied; those procedures must depend so much on the condition of the child, and the condition of the mother, and an infinite number of conditions in detail, that the conduct of the obstetrician must be based upon a broad knowledge applied to the particular case in hand. Poor judgment, or ignorance, or a want of technical skill, may destroy mother or child, or both, before the operator can be interfered with. And, in the case of a postpartum hemorrhage, there will be no time to discuss the line of conduct and the wisdom of a particular procedure. The operator will have to act instantly, and sometimes radically, and if he acts wrongly the institution will suffer for his wrongdoing. So that in this one department, at least, if the institution is to become famous for the skill and dexterity and success of its obstetric service, it would seem almost necessary to limit the courtesies of the institution to those who have well-established reputations for their ability in that field.

Relations of the Hospital to the Medical School

The relationship between affiliated hospitals and medical schools has been very far from satisfactory in the past, largely due to the differences in view-point between hospital administrators and the faculties and trustees of the medical schools.

Faculty members in medical schools have been, and still are, very prone to feel that the teaching end of the combination is about the only part really worth while, and that the hospital is an after consideration and should be merely an adjunct, and consequently under the absolute direction of the school authorities.

Unfortunately, this attitude has been strengthened and given countenance by the fact that the hospitals, as a class, have not been up to date, and have not kept in step with the march of medical science; and the college professors have felt that they should be in authority to an extent, at least, that would give them control of hospital material for scientific and teaching purposes, to the end that they could enforce what they regarded as proper hospital practice.

Very many of the college professors, too, have been either educated abroad or have taken postgraduate courses in the great centers of Europe, where patients have no other aspect than as "clinical material," without very much regard for the life or health of that material. In this country this view-point as to the patient is repugnant, and the sympathies and sentiments of the people will not permit the brutalizing instinct to prevail with public charges as its object. The humanitarian view is dominant in this country, and even in the great eleemosynary institutions, supported wholly by charity, there is a unanimous demand on the part of the public that the inmates shall be treated with something like recognition of the Golden Rule, and it goes without saying that private hospitals, and those supported in a measure by subscriptions, demand good care of the patient first and the abstract benefits to science as an after consideration.

There is no reason why the two factors in this classical controversy cannot be reconciled under terms by which both will be vastly benefited. In the first place, the schools have a right to demand of the hospital the scientific treatment of disease and equipment commensurate with that purpose, so that their students may be taught modern medical methods at the bedsides in the wards of the institution. The medical profession, as expressed in the school faculties, has a right to a review of its scientific work for the benefit of humanity, meaning by this the right of autopsies when there is any scientific point at issue. Almost, if not every state in the American Union, prohibits an autopsy without the express consent of the friends of the dead; and there is a very pervading notion in the public mind, which expresses itself also in boards of trustees of hospitals, that hospital administrators should go to the extreme in forbidding the autopsy as a sweeping routine. The law about autopsies should be changed. We are past the Dark Ages, when the mutilation of the dead was considered a sacrilege. The fact is, there is no religion dominant in this country to-day that has one word or one rule, or one principle in its creed, that forbids the autopsy, and there is no telling what untold harm is being done to humanity every day by the burial of professional mistakes, that, if properly reviewed, might clear up and make curable many diseases that are now obscure and incurable. The medical faculties are right, therefore, in demanding a better cooperation and a greater amount of complaisancy on the part of the hospital in regard to postmortem material.

Then, again, in these days of higher medical education and more practical teaching, very much of the school work is done in the wards of the hospital, and how can this teaching be done unless the hospitals themselves are doing in a routine way the class of work that the teachers are trying to impress upon their students? In other words, the professor of medicine has been lecturing for months, say, to his pupils upon the value and significance of urine examinations, blood-counts, blood-pressure, and the microscopic and chemic analysis of secretions and excretions; then he takes his class into the wards of the hospital, only to find that the records of

the institution express only the physical examination as it was conducted fifty years ago—that is, examination by the eye and ear of the physician—his splendid lectures upon the scientific aids to diagnosis must be wholly lost upon the student in such an instance as this, and the professor has a right to something better.

There is no good reason why there should be a controversy between the hospital administration and the teacher in the school. It should be well understood by both that no patient need be subjected to a clinic examination or clinic treatment without his consent, whether he be a private or charity patient. Charity patients on the wards of the hospital may have been failures in their financial operations of life, but most of them usually have a good deal of canniness or common sense, and it is a well-known mental attitude of these people that they want the highest grade of professional care, and, as a rule, they are pleased when the "professor" takes them before the class and goes over them carefully; and when he points out something to the members of the class that seems to be of unusual interest, the patient has a feeling that the professor is getting near the diagnosis, and that this must be speedily followed by a cure. It is common knowledge in hospitals everywhere that patients want to be shown before the classes, and that they go back to their wards and talk about their experiences to their fellow-patients with much pride and satisfaction.

There is a vast difference between showing the patient before the class and subjecting that patient to a painful or wearying examination, and the humane professor will be quite as anxious not to tire or hurt the patient as the hospital administrator or its trustees.

It should be the highest ambition of the trustees of the hospital to have their patients given the best possible scientific attention, and it is common knowledge in professional circles that teachers in the schools spend more time and more patience in their examinations when they know their work is to be reviewed before the class than they could possibly afford for mere private purposes; and, in the long run, the patients in the hospitals, where there is teaching and where the teachers are always on their mettle, will get better care than is the case in private hospitals, where the diagnosis lies solely in the mind of the attending physician without the stimulus of outside inspection.

It is said sometimes that the professors in the schools who hold clinics in the hospitals give orders for patients that are too expensive to be carried out, and that inroads are thereby made on hospital finances by men who have no personal interest in the conduct of the institution and its economies. This point is hardly worthy of notice. There are no professional men in the great schools of the country who are not reasonable enough to understand the limitations in the finances of the hospitals, and who will not regulate their orders accordingly.

Taking the other horn of the dilemma—hospitals that cannot afford to carry out the doctors' orders—that is, the orders of doctors interested solely in the welfare of the patient and his recovery—ought to close their doors, or else limit the number of patients within their means. We may go a step further, and say that the hospital that cannot afford the necessary apparatus and the necessary equipment to give all of the modern scientific aids to the physician, to the end that he may make his diagnosis and treat his patient properly, ought also to go out of existence, and give over its humanitarian work to those who have the confidence of the giving public sufficiently to enable them to attract the necessary funds for their purpose.

There are some affiliated hospitals and schools that are operated under one management and supported out of a common fund; there seems no reason why this fact should make any difference. The hospital administrator, if he be a medical

man, and it is unlikely that any other will be placed in charge of an institution so intelligently conducted as the school hospital is certain to be, will know quite as well as the faculty member whether a given case is in condition to be shown in a clinic, and his should be the final decision where the patients of the institution are concerned. There are certain faculty members in most schools, who either use little judgment in this regard or quite systematically sacrifice the interests of the patients to their own enthusiasm; but such men are not the dominant spirit in any of the great schools, and they can and should be controlled and their activities should be suppressed.

Then, again, questions are constantly arising as to just what service, what apparatus, and what equipment shall be furnished by the school and what by the hospital; this seems also unnecessary if both sides are disposed to be fair-minded. Of course, if either the school or hospital has plenty of money and the other is struggling to get along, the rich one will naturally have to do more than its fair share; but, if both are alike in this particular, why would it not be an equitable adjustment for the hospital to furnish everything that it would have to furnish for a high order of scientific care of patients if there were no school, and for the school to do all the work of treating the patients and furnish such apparatus as applies to the actual teaching of students, and which is of no particular value in the treatment of patients. For instance, blood-counters, hemoglobinometers, blood-pressure apparatus, electric apparatus, such as *x*-ray machines and batteries, and a laboratory in which to examine urines; blood and pathologic tissues are needed for actual diagnosis and treatment in connection with the patients, and the hospital should furnish them. If more microscopes and a greater number of these other things are needed, so that a greater number of students may have the use of them, the school should furnish them.

A great many hospital administrators and boards of trustees are under the impression that the hospital gives more than it gets out of such a partnership; but it must be remembered that school teachers are usually the best men in the community, and that they give the best of their time and their talents to the patients, not wholly with an eye single to the patients, perhaps, but they do it, and so the patients get a service vastly superior to what they would otherwise receive, and the efficiency of the hospital and the good it does are increased by that much. Even the same men, without the teaching stimulus, would not spend half the time or take half the pains with their work.

HOUSE MEDICAL STAFF

Duties of the Modern Intern

Internship in the modern hospital has changed very radically within the past few years. It is not so long ago that the hospital intern was part nurse, part doctor, and very much of a menial. He was required to do dressings, and wait on himself, to move patients in bed, to give enemas, tub typhoids, give hypodermic injections, do all the catheterizing of patients, and see that the doctor's orders were carried out; in some hospitals, in order to fill in his time, he was expected to clean instruments and apparatus, and do a good deal of work that is now confined to the hospital orderly. No doubt in many hospitals this general routine of intern duty still prevails to a certain degree, especially in small hospitals, and in this class of institutions that same intern will be charged with the serious care of patients.

In the modern hospital this has changed to a great extent, and the character and equipment of the intern has changed. Under the old régime, the intern had often come direct from the plow, with little or no education, and had "read" medicine for two short terms of four or five months each, and he was expected to be equipped to practice his profession, but in those days there was practically no hospital pathology, almost no urine examination, no blood work whatever, and no scientific work of any kind, except that practised by the attending physician, with his trained ear and finger and eye, in the physical examination of his patient at the bedside.

To-day the duties of the intern are almost exclusively scientific in progressive institutions. He is charged with the taking of the histories of his cases, with making at least a preliminary physical examination, and he is expected to make, or know how to make, urine examinations, blood examinations, to make blood-counts of all sorts, to measure the hemoglobin, to take the blood-pressure, and to interpret all of these findings in the light of the scientific literature of his profession. He is expected to be a master of the microscope, and to make diagnosis from tissue taken from the operating-table. Not only this, the intern in the modern hospital is expected to work out, under the direction of the attending physician, some definite, original investigation into the etiology and pathology of disease with material gathered at the bedside of his patients.

But the preliminary equipment of the young physician intended for this sort of work has grown quite in step with his duties. Nearly all first-class medical schools to-day require a high order of preliminary education. A few of them accept only college graduates, and hardly any of the schools worth mentioning admit a student who has not had at least some college training. In most of the universities there are special courses for men who expect to study medicine, and they are taught physiology, organic and inorganic chemistry, biology, botany, and microscopy in preparation for the strictly medical training. In a few more years no man who has not had this training will be eligible for admission into any first-class medical school.

Then, these young men have at least four years of grinding work in the various branches of medicine, a great deal of time being spent at the bedside and in the laboratories of good hospitals, so that when they are graduated they have a fine foundation upon which to build a highly specialized career in their chosen profession.

The men who are thus well equipped almost all find places in the large progressive hospitals, at the present time, where there are medical staffs of high attainment and modern learning, and pathologic departments presided over by thoroughly trained scientific men. It goes without saying that these men in such institutions achieve the highest possible order of success, not only during their intern days, but afterward.

Anything short of these standards of internship, both as to preliminary equipment and service, must be makeshifts in institutions that, because of their poverty or small size, or both, cannot afford to command the highest order of talent.

Just here, in passing, it might be suggested that the small hospital could well afford to pay for the services of at least one young man who has had a complete training in some high-class hospital, and who would enter with a progressive and scientific spirit into the work about him, to the end that the institution would progress, at least in a small measure, commensurate with the possibilities of the time.

Usually interns serve two years in the hospital, one year as junior and one year as senior. There are variations in this regard, especially where there are permanent services in the institution, but in the majority of the hospitals of this country this is the term of service of internship, and the specific duties of these young men can be pretty well defined along logical lines. In some hospitals, especially the larger ones, there are regular house physicians in the several departments, men who have graduated from their internship, and who are given third or even fourth year work to fit them as specialists. This is an excellent system for several reasons: in the first place, it gives the attending physicians a higher order of expert assistance, and to that extent is in the direct interest of the patients; next, it gives an excellent special training in some chosen branch to a young man whose counterpart of several years ago had to go to Europe for that finishing course.

Duties of Junior Intern.—Let us take the junior intern immediately upon his admission to the hospital, and follow him through his various routine duties, as those duties seem to fall to him naturally.

The place at which his service will begin is the laboratory of pathology, where he should have a training of at least two or three months in urinalysis, blood examination, and clinical pathology under the immediate direction of the very best talent obtainable. Naturally, if the full corps of junior interns is taken into the hospital at one time, it will be impossible for all of them to get their laboratory training before they are sent to the wards. This is a misfortune, the only cure for which is to give the men a part of their laboratory training before they are officially entered as interns. In many schools the men graduate some months before the time arrives for them to enter the hospital to which they are appointed, and, when this is the case, they can be given a good deal of preliminary training before their formal advent in the institution. Different hospitals will have different methods of arriving at an arrangement by which all the men can go into the wards with a practical laboratory training. The main thing is that they should have this training in some way at the very earliest possible moment in their hospital careers.

If the junior intern can have three months' laboratory service, one-third of this period may be spent on urine work, and he should be trained thoroughly in the

chemistry and bacteriology of normal urines and the departures from the normal in the course of disease, and he should be compelled to study hard in the literature concerning the significance of urine pathology. His second month may be devoted to blood work, the first phase of which will be blood-counts, white and red, and the differentials. He should have a severe practical drill in the physiology and pathology of the blood, using the material of the hospital wards. He should be taught the technic of blood bacteriology and the significance of the blood-pressure, the hemoglobin, the Widal and Wassermann tests, the various tuberculin tests, and their reactions and value. During this period he should be given a sufficient amount of milk investigation to make him familiar with the technic of milk examinations—physiologic, bacteriologic, and chemic. This work in milk need not go into speculative fields, but there are certain definite agreed constituents of milk, physiologic as well as bacteriologic, and these things the first year intern ought to know.

The third month of the intern's stay in the laboratory may be most profitably spent in clinical pathology—the examination of tissue from the operating-table and the identification of morbid growths. This month's work may also take him back into the field of blood pathology, and his training at this period should also include a study of blood-serum and the various branches of serum therapy, the vaccines, and antitoxins. Naturally, these latter studies would more properly come during the second month, in connection with his blood work, but they might be also classified as a finishing course in blood study, and he will probably have more time to do this work and be better equipped to understand it than if it had come earlier in his training.

Nearly every hospital nowadays does certain of its pathologic work and microscope analysis in small auxiliary laboratories, located at some point convenient to the various wards, and a good deal of the laboratory work can be done there by the junior intern. There are two or three reasons why these small department laboratories are advantageous, the chief of which is the personal equation. Nearly every attending physician and surgeon has pretty definite notions of his own concerning the laboratory work that he wants done on individual patients, and he will want to see the results of this work without having to follow the specimen to the main laboratory of the institution; therefore, he gives his orders to the junior intern, who carries them out personally in the auxiliary laboratory, where the specimen can be saved for him and shown to him by the man who has done the work. Thus there can be a definite study of the individual case, correlating the laboratory finding with the clinical picture, which is an immensely important thing in diagnosis. There is also a great saving of time where these auxiliary laboratories are operated. Let us say there is a case of nephritis, or any of the lesions in which there are variable quantities of albumin and sugar in the urine; the intern who is examining the urine of a given patient every day, or at stated intervals, will soon come to have the daily recurring picture in his mind, and, at a glance, will be able to tell whether the albumin or sugar is increasing or decreasing without very much of a quantitative examination, and, while it requires only a moment to obtain a sugar or albumin reaction, it requires many minutes to make a complete urine examination. If the specimen goes to the general laboratory of the hospital there is no individualism in the specimen, and the man who does the work has no notion of the peculiarities of the case. Therefore, he is compelled to make a complete examination and send up a complete report, whereas the intern on the case, working in his little cubby-hole, can make a better finding at infinitely less pains from the view-point of the physician in the case. There is another saving: it too often hap-

pens that the attending physician orders a daily urinalysis or an hourly blood-count, and the nurse, in her zeal to obey instructions, sends the specimen to the laboratory for weeks and even months after it has ceased to be useful unless she is stopped; then, again, a good many visiting physicians ask for urine and blood examination just as a routine practice, and the intern, making the rounds with his senior, will rarely interfere unless he is having the work to do himself, in which case he will often be able to call the attention of the attending physician to the fact that he is very busy, and get the order called off. So that from every conceivable standpoint the auxiliary laboratory is an advantage in economy and efficiency.

The next most important duty of the junior intern, after he arrives on the wards of the hospital, is history taking. This is an immensely important part of the examination of the patient, leading up to diagnosis; so important, indeed, that nearly every hospital staff member has at some time in his career created for himself some special system of history writing, and there are almost as many systems in existence as there are physicians in practice. We go into this question of history writing so completely in our section on the Records of Patients that we will pass over it for the present.

These two duties, that of doing the laboratory work and that of writing the histories, are the only ones definitely assigned to the junior intern in the hospital, merely because he is a junior intern. In addition to these duties, he should share with his senior the privilege of accompanying attending physicians upon the rounds of the hospital, taking orders, getting his first lessons in physical diagnosis, and in the treatment of patients. He should be allowed, likewise, a share in attending the visiting physician on the rounds of the private cases, so that he may learn something of the ethics of his profession, how to handle sick patients of the higher classes, how to meet their relatives, and to act diplomatically and tactfully in dealing with them, and he should be expected to always be on the wards of the hospital during the regular visiting hours of the institution, not only for the purpose of guarding the patients from undue annoyance by their own or other visitors, but for the purpose of answering pertinent questions of anxious relatives; no matter that the patients are poor and illiterate—they are human and suffering, and they have relatives who are anxious about them, and who are entitled to courteous answers to their inquiries as to the probable duration of the patient's illness, his likelihood to recover, and to smooth out any unnecessary misgivings concerning the case.

Where the medical department of the hospital is a very heavy service, the junior intern will always have to divide with his senior the duty of watching the detailed care of patients at the hands of the nurses and orderlies. If he does not catheterize, he should see that that service is properly performed. He should see that typhoid and pneumonia cases are properly tubbed for reduction of temperature, and he should be almost constantly about the wards to watch after the personal comfort of his patients, and to exercise perhaps a greater amount of discretion in carrying out the attending physician's orders than would be allowed a nurse or an orderly.

Surgical Department.—In a good many hospitals the junior interns in the surgical section give the anesthetics. There are many surgical operations whose chief danger lies in the general anesthetic, and it would seem that this procedure is important enough and sufficiently scientific to engage the best attention of well-trained men. In some institutions there are regularly employed and highly trained medical or non-medical women, whose only duty is to give the anesthetics; and, where there is peculiar fitness on the part of the individual, this is all right, but as a rule or practice it can hardly be countenanced. Anesthetics affect individuals differently, not only because the individuals themselves differ in their physiologic

make-up, but because of the nature of the disease from which they are suffering, as, for instance, heart cases and nephritics, patients who have bad lungs, and the like, and oftentimes in the course of an anesthetic there comes over the patient almost an instant change, which the medically trained person will recognize at once as the effect of the anesthetic on a peculiarly susceptible patient, and with this change will come the necessity for immediate action to bring relief. It would seem that the frequency of these emergencies would plead in favor of a skilful anesthetist who has had a careful medical training. If these premises are logical, it naturally follows that the junior intern is not a good anesthetist, and that this important work ought to be laid upon more responsible shoulders; but in most operative surgical procedures of the present day the surgeon can advantageously use two assistants: one, the senior, who will stand opposite him and give him trained technical assistance, and the other, who will hold retractors, move extremities, and do other work of not quite so technical a character, and it would seem that the junior intern ought to be allowed to do this work in preparation for his subsequent more responsible duties. In this department, also, the junior intern may have an opportunity to assist in putting on plaster casts and various surgical splints, including the various suspension splints. He will have learned also, in the course of his laboratory experience, to make lumbar puncture, do venesections, and the various transfusions; as a rule, too, the junior does at least part of the dressings. Sometimes the senior will take the clean dressings and the junior the infected or open cases.

Obstetric Department.—In the obstetric department it is the rule in most institutions to allow the junior intern to participate in the delivery of patients during the presence of the attending obstetrician, and to be generally helpful in the delivery room. He should be charged with looking after the infant immediately upon its delivery, the washing of the eyes with prophylactic solution, the care of the cord, the examination and measurement of the placenta for the detection of retained particles; then, immediately after the infant is tagged and taken from the delivery room, it should be his duty to take its measurements and weights. In institutions where outside physicians are allowed the courtesies of the maternity department, it should be the duty of the junior intern to see that the outside physician is inducted into the mysteries of the department technic, to see that he reads the few rules for attending men in regard to the wearing of gloves, the scrubbing up processes, and the other essential points in a well-regulated maternity department. In some institutions a good many of these duties are left to the nurses, and there can be no valid argument against this, excepting, perhaps, that an intern may more diplomatically lead an attending physician into proper channels than the nurse, but the junior intern should at least know how to do these things, and how to regulate the department in the absence of his senior or the staff obstetrician.

Other Departments.—The specific duties of the junior intern for the department of medicine, surgery, and obstetrics will naturally follow in the other departments of the hospital, as, for instance, the junior in the pediatric service will in all medical cases follow the routine of the practice in the medical department, and in the surgical cases he will follow the practice in the surgical department. In such specialties as gynecology, the eye, ear, nose, and throat, and in the section on genito-urinary surgery the duties of the junior will be obvious.

In the children's department, where the institution has an isolation building, there will usually be a special intern, who will be thoroughly trained in the prophylaxis against carrying infections from one class of diseases to another. If this isolation service is a very small one, and the discipline of the interns is rigid, the junior intern will not infrequently be allowed to take care of the infectious diseases,

under most rigid directions as to the care of his hands, clothing, and person generally; but oftener, and perhaps more properly, the care of the communicable infections will be restricted to the more responsible and hence more careful members of the attending staff.

Duties of Senior Interns.—The senior interns are supposed to have had junior service in all the departments of the hospital in which they are working as seniors, and, upon arrival at their seniority, are supposed to be equipped to represent the attending physician during his absence. They will, of course, have junior interns under them, and, if they are to be held responsible for the care of patients, they must be clothed with authority over their juniors, so that they can apply some sort of system in getting the work done. They will not, of course, have disciplinary power over the junior interns, and can only report their derelictions to the superintendent of the hospital, who will naturally back up their requirements to any reasonable extent. It should be the duty of the senior intern to see that the junior writes the history in all cases admitted, promptly and efficiently, and the senior will also see that the junior does whatever laboratory work may be required for the presentation of the case in a proper manner on the next visit of the attending physician.

The senior intern is charged with the duty of making the physical examinations of all ward cases, preliminary to presentation to the visiting physician.

Sometimes the attending physicians prefer to make this physical examination themselves; there are two advantages in having the senior intern do this work: First, so that he may order the necessary laboratory work on the patient, in the light of the clinical picture, which can be reported to the visiting physician upon his first introduction to the case; second, the making of the physical examination by the senior is most excellent intern practice, as he can be checked up on his diagnosis by the visiting physician in whose service he is working.

It naturally will be the duty of the senior intern to perform such minor technical operations as venesections, subcutaneous and intravenous normal salt irrigations, spinal punctures, and the injection of whatever vaccines and serums may be prescribed, always subject to direction by the attending physician, of course.

The senior intern in the surgical service and the various surgical specialties will naturally act as first assistant to the operating surgeon, at least in all ward cases. Sometimes the surgeons have a private assistant of their own whom they require to assist them at operations upon their private patients, and these private assistants are a bone of much contention in a good many institutions. Naturally the surgeon has a perfect right to demand a high order of service in his surgical operations, and oftentimes a very exacting surgeon, who happens not to approve the class of assistance given him by the particular senior intern who serves him, will wish to call in his own private assistant, even on free or ward cases, and it is a serious question how far a hospital administrator may go in his insistence that the house senior intern shall be first assistant to the operator. It would seem equitable that the operating surgeon should accept the assistance of his senior intern, other things being equal, in all operations on free patients, and in the cases of all those who pay a very small sum for their keep in the hospital and who do not pay a fee to the surgeon; but at the same time the surgeon is responsible for his work, and he will probably be quite as insistent about expert help on the ward cases as on private ones; and who shall insist that he use an intern he regards as incompetent, especially since it is common knowledge that suits for malpractice are oftenest brought by this class of patients?

By the very nature of things, the senior intern, who assists his chief in surgical

operations, must do the clean dressings, and should keep himself clean to that end, because at any moment he may be called upon to go into a clean wound with his chief, and the junior intern may well be charged with the duty of doing the dressings in pus cases.

Since the senior intern assists his chief in surgical operations, it falls, of course, that the same intern should write up for the record the gross pathology of all surgical operations performed at which he is present as first assistant.

The above division of departments, as between the junior and senior intern, will hold as a general rule in the average hospital. Most visiting physicians and surgeons will want the continued service of one man to take orders on individual private cases during the whole case, and sometimes the duties of the junior and senior will be so divided up that a junior intern will be compelled to make rounds with the chief of the department, and it will be necessary for him often to continue constantly on certain very special cases in the house, such, for instance, as those in which the attending physician may apprehend some serious and sudden emergency. It will make very little difference in such cases whether the intern is a junior or senior, but may make a vast difference whether he has been given such explicit orders as will enable him to meet such an emergency.

Methods of Choosing Interns.—It is impossible to fix hard-and-fast rules for the choosing of interns. In every method there are difficulties and disadvantages, and a method that would be ideal for one institution would not do at all for another. There are some hospitals that will always have difficulty in securing a sufficient number of competent young men to do the work in the institution, first, because these small hospitals are usually not very well equipped to do a high order of scientific work; they have no high-class paid pathologist to train these young men in one of the most essential features of their education, and, therefore, the best men will choose larger and more roundly equipped hospitals where they can get a better training; then, again, in the smaller hospitals the material in the shape of patients will be more or less limited; and, third, usually these smaller hospitals cannot afford the proper paid help to do the menial work, and they are sometimes short of nurses, and the interns will, therefore, often be called upon to do work which they regard as that of a nurse, or even of a menial, and they do not take to this sort of work, especially in view of the fact that in the larger institutions their duties are so different. However, there are some very fundamental thoughts that ought to underlie the choosing of interns even in small, not very well-supported institutions.

One of the very worst things that can happen to a hospital is to be compelled to accept for an intern the son or protégé of some influential man in the institution, a member of the board of directors, a powerful member of the medical staff, or a consequential contributor. The disadvantage of this sort of an intern is not confined to the small hospital, but is present wherever such an intern is accepted. The first one may be a high-class, ideal young man in every way, and he may perform his duties so equitably that this method of choosing interns will become a fixed custom in the institution, and continuously a number of men whose influence has secured their positions for them may all be most acceptable young physicians, but there will almost inevitably come a time when the custom will be abused, and some unworthy young man will get in by reason of his social or professional influence, and one man of this class can undiscipline and disorganize a whole institution. Oftentimes his conduct will be in utter defiance of rules and of the discipline, and he will often attempt to overrule orders by the superintendent.

If direct appointments of interns must be made by the board of directors or by the medical staff, without any examination of the qualifications of the applicants,

it is very far better to inaugurate some system of choice that will prohibit the fastening upon the institution of some unworthy protégé of some strong supporter. One method of such choice is to leave the matter to the dean of the nearest or most favorably situated medical school, or the registrar of the school, who can present the opportunity afforded by the hospital to the senior students, and very often some excellent young men can be secured in this way, especially if it does not necessitate their coming up for a competitive examination. There are a number of small hospitals that secure a rather high order of interns in this way.

A good many small special hospitals, such as sanitariums and invalid homes of various sorts, pay a small amount for their interns, and get them from the large institutions after they have served a year or two. A good many of these young men are poor, and need to make a little money before starting out upon their careers of medical practice; and very often, for $25 or $50 per month, excellent young men can be had by this sort of fellowship. Some of these institutions employ one good ex-intern of a large hospital, and then appoint the balance of the corps in some other way and without paying them; they may be fresh out of school, chosen perhaps in the manner first named, that is, by appointment on recommendation of the dean or registrar of a medical school.

The direct method of appointment of interns, without recourse to any examination whatever, is quite as inimic to the best interest of the large hospitals as the smaller ones, and for the same reasons, so that to-day in nearly all of the large institutions of the country the choice of interns is by some method looking to competition. Sometimes the competition is in the shape of a written examination only; sometimes it is oral only; sometimes a combination of the two, and in a few instances, another phase is added by way of a personal inquiry into the habits and morals of the candidates, and they are marked on these virtues and personal vices in the same way as in the written and oral examinations. A good many hospitals are directly affiliated with medical schools, and, where this is the case, the choice of interns must be made from the students of the school, oftentimes without any further inquiry than the markings of the students during their undergraduate examinations; that is, the highest men in each class are given the intern positions in the hospital attached to the school.

But, as an abstract proposition, the competition method of choosing interns is pretty well established, and the experience of years has led to a definite routine in the choice of these young men—almost to a technic, it would seem.

The first step in this competitive procedure is to post a notice of examination for internship in the institution on the bulletin boards of the medical schools whose students are invited to participate, and this notice calls for the personally written application of those young men about to graduate who desire to take the examinations, and who are asked to file with their applications such letters of commendation as they can secure, preferably from the officers of the school and from the leading men of their home towns—ministers, physicians, and the like. The administrators of the hospital have their first opportunity, in these written applications, to cull out any undesirable candidates, if such are found, early in the procedure.

The next step is to request the presence of the applicants in person at the institution at some appointed hour, ostensibly for the purpose of registering for the examinations, but in reality for the purpose of a review before some committee, preferably one composed of an equal number of the members of the board of directors and of the medical staff; but care should be taken, when medical men are chosen for membership on this committee, to see that the same men are not later chosen to conduct the examinations. The young men can be ushered before

this joint committee one at a time, their names and addresses and home towns can be taken, the personality of the applicant in each case can be considered by this joint committee, and, upon the exit of each one, some appointed member of the committee can set down the relative marking of the candidate. If he is of excellent personality, and apparently in every way a desirable man for an intern, he can be marked AA, or 100. Sometimes this ordeal will eliminate one or more undesirable men who might pass excellent written and oral examinations, but whose personality, for one reason or another, would seem to render them wholly undesirable as interns, and in such cases it would seem to be the privilege of the committee or its executive officer, the superintendent of the hospital, to privately advise such applicant not to take the examinations.

The next step in the procedure is the beginning of the examinations, written and oral. If the examinations are to be entirely fair, and beyond question of fairness, the following preparation is in general use:

There are a sufficient number of envelopes enclosing a card, so that there will be one for each applicant. These envelopes and the enclosed card are numbered from one up, the same number on the envelope and card. These envelopes, with the card enclosed, are passed around as the applicants sit at their desks, ready to write. The men are required to take the card from the envelope, write their names on it on the same side as the number, place it in the envelope again, and seal the latter. Each man is notified that he will bear the number that has been given him throughout the examinations, written and oral, and that he will be expected to place his number on every sheet that he writes, and that when the oral examination takes place he will introduce himself to the examiners by number and not by name.

The sealed envelopes are then placed in a receptacle, usually a metal box, securely locked, placed in the vault of the institution, and the keys will be handed to some responsible person, to the end that the box may not be opened again for any purpose whatever until it is finally opened in the presence of the applicants themselves, or some committee agreeable to them, or in the presence of the board of directors or medical staff of the hospital, for the purpose of ascertaining the names that go with the fortunate numbers.

It is usual that the written examinations in each branch of medicine are conducted by the staff members in that branch; for instance, there are four members of the surgical staff, and the examination in surgery will take place from nine until ten, and there are four questions, each with one or more parts. Each surgeon will write a question, seal it in an envelope for security, and let it be opened the moment that the examination is about to begin, when all the questions will be written on the blackboard. Sometimes the department staffs will appoint one of their number to conduct the written examination in the subject, and generally he is aided by one or more members of the house staff of the hospital or by the superintendent of the institution. Sometimes the members of the staff merely hand in their questions, and the superintendent of the institution, to save the time of the attending physicians, will conduct the examination, aided by some of his interns. Usually the examinations, both written and oral, will include medicine, surgery, obstetrics, gynecology, pediatrics, and pathology, the latter including bacteriology and urinalysis, and the other branches will naturally include the specialties that are related to them.

At the close of the written examination the papers will be examined by the men who have prepared the questions, each member of the staff marking only the answers to the question that he has handed in. It is oftentimes very difficult to

get the members of the staff to take the necessary time to mark the papers, in which case that duty is relegated to some of the younger men, ex-interns or adjunct members of the staff, and these younger men confer, before beginning their work, with the men who have asked the questions, so that there will be uniformity in the markings, and so that the markers can follow the ideas of the staff members as to the relative value of the different sections of the question and the relatively important phases of it. But all papers should be marked by the same person or persons to insure fairness.

The oral examinations are usually held by two or three members of the staff in the various branches sitting together, and this would seem necessary, because if one member of the surgical staff, for instance, examined groups of the men, and others examined the balance, the examiners might differ very materially in their estimate of the answers, and so inevitably be unfair in their markings; but, where there are two or three men for each branch, the candidates can enter the room one at a time and answer the questions put to them by the examiners, and, after the applicant has left the room, each man can give the marking he thinks proper; if there are three examiners, the three marks can be added and divided by three, which will give a fair average of the applicant's percentage in the oral examination in that branch. At the end of the written and oral examinations a committee appointed for that purpose can take the percentages in the written and in the oral examinations and in the personal inquiry that was made by the first joint committee, and the sum of these markings divided by the number of subjects will give the proper averages.

Rotation or Permanent Service.—There is no doubt that the ideal intern service, from the standpoint of the patient and of the institution and the attending physician, is one in which the men are continued in one place for the longest possible time, largely because they become efficient to an extent that is impossible where frequent changes are made, and many hospitals practice this continued or permanent service of the intern staff.

Continued service in one department of a general hospital is attractive to the bright, well-equipped young medical man. It serves to bring him to a specialty in his profession by a short road, but it may be fairly doubted whether he will be able to go very far in his specialty, handicapped by the limitations of such a training. It matters little whether the medical man is a general practitioner in a country town, or whether he is a specialist in some particular branch in a large city, the measure of his success in a final analysis will depend upon his ability to make diagnosis of disease. The intern who leaves school after a theoretic training, and is immediately given service in the surgical section of a large hospital, for instance, may become a most expert and skilful mechanic, but such a service will not make him a good diagnostician. He must have served under a skilful chief in the medical service before he can make a diagnosis in cases of abdominal pathology for instance; and, if it be an adult female, he must have served in the gynecologic and obstetric service if the patient is to get the largest measure of profit from his knowledge and experience. It is one thing to do a surgical operation laid down in the text-books on classical lines, but it is a vastly different thing to make a diagnosis and to determine a course of treatment in the same case, and the man with one-sided training, such as continued service in one department of the hospital would give, can never hope to hold his own with the trained men of the present day.

In the smaller hospitals the interns will naturally rotate, or, at least, they will be compelled to cover a good deal of ground, and to take in, perhaps, at the same time, several classes of patients. In such an institution the training will depend

a good deal on their superiors and the scientific work they are compelled to do. In the large municipal institutions, where there is vast material in every department of medicine and surgery, it would seem that the intern should be given a careful, methodical training in all departments, so that, if he should then desire to proceed along some special line, he will have had abundant general training to lead up to that. In a few institutions in this country an attempt is being made just now to give a large body of interns a general training in all of the departments, and to give a few carefully selected men special training as a sort of postgraduate course.

Up to within the past very few years it was conceded that no man could be a well-rounded out specialist in any branch of medicine without a European postgraduate training. Recently, however, even Europeans concede that there is some merit in American training, and a few of the large institutions are prepared to demonstrate that fact by giving a finishing course for special work to especially equipped young men to fit them for practice in one or another of the branches of medicine.

Two or three of the departments in a general hospital would seem to suffer much more than others from a frequent change in the service of interns; the one most vitally affected is, of course, the maternity service, and the one that suffers only slightly less is the children's department. Very great harm can be done in almost a moment in the maternity department by inexperienced or inefficient men, and it is impossible to hope that the intern service can be so regulated that there will always be present for every occasion an experienced visiting obstetrician. A young man, who has had only two or three months' obstetric training, is hardly equipped to intelligently examine patients with a view to ascertain abnormalities and to lay out a program for the delivery.

In the children's department the particular need is for a man who can determine the difference between the adult and the child, not only the physical signs of disease between the two, but for purposes of surgical diagnosis and operative procedure. Naturally, also, it will require a great deal of experience for these young men to make early diagnosis of the communicable infectious diseases, such as the exanthemata.

Limited Rotation.—Perhaps there is a happy medium somewhere between the continuous intern service and short rotation. For instance, the young man who thinks he would like to practice obstetrics as a career must know a good deal about gynecology, and ought to have a service in that department; the obstetrician must, of course, know children and their diseases, and he ought to have a service in that department. The young man who is enthusiastic enough about his own future to select the profession of surgery at the outset of his career will not only want to do surgery in the hospital, but he must have a thorough training in medicine, for purposes of diagnosis and differential diagnosis. He ought to have work in the nose, throat, and ear department, in the genito-urinary wards, and in the orthopedic section of the children's department. The young man who inclines toward internal medicine must, of all things, have a thorough training in the laboratory of pathology, bacteriology, and urinalysis, and it will not be quite so important for him to see very much surgery or the special surgical branches.

Naturally, the young man who thus chooses a specialty for himself ought to be given a service in that specialty in the hospital, immediately after he has had a good preliminary training in the laboratory of pathology. He will acquire in his first training a fair idea of what a special branch contemplates, and he will go into auxiliary service in other departments with a good deal more enthusiasm than if he

were put into these first without having been led up to them. For instance, the young prospective surgeon would hardly be able to appreciate the surgical necessities in the field of diagnosis until he had had actual work in surgery, but he could never acquire ability as a diagnostician without service in the medical wards, and his first service in surgery would convince him of this.

Ethics of Internship

Relation of Interns to the Superintendent of the Hospital.—If one will look about the country to find the well-conducted hospitals, he will soon realize that the best are those that have an executive officer of first-rate ability, and one of the most important functions of the executive is to take good care of patients. He cannot do this without the best of intern service, and he cannot have such service without the fullest measure of authority over the interns, personally, with power to discipline them when necessary. Therefore, the interns in the hospital ought to be directly under and answerable to the superintendent. The rules for these young men should all contemplate responsibility to the head of the hospital. These young men will have duties that involve the patients, the attending physicians, the training-school, and the public, but there can be no divided authority that will be conclusive or final, so that, in all of their dealings, these young men should understand definitely that they are answerable to the superintendent of the hospital and, as a finality, to no one else. On the other hand, the superintendent of the hospital should give the greatest possible consideration to these young professional men. He should uphold their dignity in every possible way, compel obedience to their proper professional orders, and, when a plain duty necessitates his decision that they have been wrong in a given case, it is highly essential that the decision be rendered in such a way that the position of the intern will not be made untenable by the fact that a nurse or a junior medical man has reversed his orders.

In his relations to the interns, it will be the duty of the superintendent of the hospital to see that their living arrangements are pleasant, that their quarters are comfortable and well furnished, that they have facilities for recreation, quiet places in which they may study, that their food is wholesome, well cooked and well served, even if plain. These young men have usually come from well-to-do homes in which the creature comforts are present, and if they are the right sort of young men their abilities will insure for them in the future the personal comforts, and even luxuries, of life. So that in this formative stage of their careers they should be made as happy and comfortable as possible. There seems to be the best possible atmosphere to encourage work, and interest in the work of the institution, where the superintendent of the hospital is on such terms with these young men that they can go to him in their troubles, confide to him their difficulties, and confess to him any wrongdoing or negligence of which they may have been guilty, and the discipline of the institution will hardly ever suffer when such a relationship exists. When interns are found fault with by visiting physicians, their superiors, the superintendent of the hospital will hardly do his whole duty in such a case without an unprejudiced examination into the facts, and the interns ought to feel that their side of the case will be given a fair hearing, and that they will not be disciplined unless they have deserved it. Sometimes the visiting physician will, for some reason, take a peculiar dislike to an intern, and sometimes unjustly find fault with his work; sometimes, too, attending physicians are tired and irritable and unreasonable—as all human beings are on occasion—but that is no reason why an intern should suffer or be humiliated.

Relation of Interns to Visiting Physicians.—Visiting physicians are charged with the treatment and care of patients, and their orders should be conscientiously and as literally carried out as each case will permit, and, if the interns are directly answerable to the physicians whom they are serving in the institution in all professional matters, the largest possible measure of good to the patient will be the result.

Rules for interns must explicitly state that they are to keep in constant touch with the men whose patients they are watching; that any radical or alarming change must be immediately reported to the attending physician, and any question bearing upon the condition of the patient must be reported to the attending man at the first opportunity, whether that question concerns the actual physical condition, medication, or dressing of the patient, or whether it be a social question concerning the patient's relation to his family or friends or to the hospital. When a patient dies during the absence of the attending physician, the intern should immediately communicate the fact to his senior, for the purpose of getting orders as to the signing of the death certificate, or whether a certificate shall be signed, and whether the physician desires to sign it himself or requires that his intern shall do so.

The interns in the hospital should make every endeavor to prepare the cases for visiting physicians, and to anticipate their wishes in regard to laboratory or blood work that ought to be done. The intern should see that the histories are properly written, and that the greatest possible amount of information is at hand for the first visit of the attending physician, in order to minimize the labor of that busy man.

The relationship between the intern and his senior, the visiting physician, should not be wholly one-sided. There are obligations on both sides. The young man is serving his internship for the purpose of learning the greatest possible amount about the practice of his profession, and it is the duty of the attending physician to help him in every way. The most successful visiting physicians in getting work out of the members of the house staff are those who are courteous and considerate toward the young men. This does not mean obsequiousness; it means merely that these young men stand in the relationship of a junior and assistant, a professional apprentice to the older and more experienced visiting physician, and they ought to have the benefit of every aid that he can give them. Unfortunately, some visiting physicians demand the respect of the members of the house staff; instead, they should command it. They should deserve it by their conduct toward their patients, toward the nurses, toward the hospital officials, and toward the young men themselves. In the experience of the oldest and maturest hospital superintendents there comes rarely an incident of insubordination to authority on the part of interns that there is not some justice on both sides, and too often the justice is far more on the side of the hospital intern than upon that of his senior. Perhaps one reason for this is that visiting physicians are busy, tired men. The interns are sometimes ignorant, the visiting physicians impatient and intolerant of ignorance, and it has been very often known to happen that interns have lost their respect for a senior wholly because of the latter's inattention to his duty, his neglect of his patients, and his failure to perform a high order of professional service, and these young men are quick to grasp such failure.

The relations between the visiting physicians and the members of the house staff, and the obligations of each toward the other, need in no way affect the relations of each toward the superintendent of the hospital. When a visiting physician finds carelessness or neglect, or a failure to perform a manifest duty on the part of the intern, there is no good reason why he should not censure his junior with becoming

dignity, which need never, and which should never, go to the extreme of abuse or offensiveness of manner or language. If the offense on the part of the young man is severe enough to justify that course, it should be the duty of the attending physician to bring the incident to the attention of the superintendent of the hospital, who, after all, must be responsible for the conduct of these young men, and in whose discretion should be left whatever action is necessary in the case. Too often visiting physicians, fearing some retaliatory act on the part of the intern, will complain to the superintendent of the hospital, but will make the proviso that nothing shall be done in this particular case because the informer desires not to incur his junior's enmity. This course of conduct is hardly fair. Perhaps the intern has not been at fault at all, perhaps the visiting physician misunderstands the attitude of the intern in the case, and perhaps from sheer embarrassment the intern has failed to set his position correctly before his senior; it would seem, therefore, the duty of the superintendent of the institution to insist upon an immediate reckoning of the case, without fear that the feelings either of the attending physician or the intern may be hurt. Such an outspoken course promises a clearing of the atmosphere, and oftentimes a return to the friendliest feelings between the two gentlemen, who, after all, must work together if there is to be a high order of service and what may be called team work.

Relation of House Medical Staff to the Nurses.—A discussion of the relationships that exist between the young medical men of the institution and the nurses is an approach toward very delicate ground. It may not be hoped that any attitude assumed on this question will be free from censure, or accepted as final, by any considerable number of people involved in this relationship. Perhaps, then, the most important feature of this relationship involves the broadness or the narrowness of those who are responsible for the actions and conduct of the young people of both sexes. Generally speaking, the young medical men of an institution will just about measure up to the opinion of their seniors. If the attitude of the board of directors and the visiting staff, the superintendent of the institution, and the head of the training-school is one calling for the highest honor and the most gentlemanly bearing of these young men toward the young women with whom they must daily come in contact, it might be taken almost for granted that the young men will live up to this good opinion, and this rather complacent attitude as to their moral tone. If, on the other hand, those over them assume that these young gentlemen are reprobates and dishonorable, and that they must be watched carefully to see that they do not commit all the indiscretions and crimes possible, it is more than likely that the attitude of the young men will be one in which trials of wit and daring will be the chief feature. They are put upon their mettle, they are distrusted, they have a bad name, and are more than likely to try to deserve it.

In many institutions there is a hard-and-fast rule that interns and nurses are not allowed to speak to each other except while on duty, and then only concerning work in hand. There are other institutions in which nurses and interns are dismissed from the institution for having any sort of social relationship, such as an evening walk together, or a chat in some quiet part of the grounds of a summer evening.

On the other hand, there are institutions in which parties are given to the young people, and during which they are allowed to dance with each other and have a good social evening of it. Not long since in a certain large institution such an arrangement as this began. The nurses were given a party each month, and the interns were always expected. Before the first party was undertaken there was a heart-to-heart talk with the nurses and with the interns, in which the epoch of

parties and evening entertainments was promised, only on the condition that the entertainments would continue just so long as the young people appreciated them to an extent that would not allow them to interfere in any way with their respective duties in the institution; that if it became necessary for the young people to chat about "last night" during their work in the institution the next morning, and to live the evening's entertainment all over again when their duties were elsewhere, then the parties would cease and never again be commenced. The evening entertainments in this institution have never been interrupted since that time, and there never has transpired a single incident in the conduct or actions of either interns or nurses that could give rise to a feeling on the part of their superiors in the hospital that these entertainments were unwise.

In this same institution the nurses and interns are allowed to walk out together when not on duty. They may sit together in the grounds and on the steps and enjoy short periods of comradeship, and if an eavesdropper could hear the conversation during these resting spells, he would oftener than not find that it drifted toward the duties of the day, a recitation of the trials and triumphs in the sick ward. If once in a long while Cupid should chance to perch himself upon the back of a bench between one of these young couples, the eavesdropper would find that the Cupid was an honest youngster, free from guile, and that he was shooting an honest dart, and if the eavesdropper remained until he had seen love's arrow pierce the hearts of the young wooers, he would hear their conversation bent upon the future, with perhaps a recitation of the hopes and the fears of an honest union as the two should walk together down life's busy way.

So that it would seem the relationship between the young people and their seniors, and the conduct of these young people toward each other, can be regulated almost at will by the seniors, without in any way limiting the freedom of intercourse of the young people.

Relation of the House Medical Staff Toward Patients.—It has been truthfully said that the worst place for a young medical man to begin his career is in one of the large charity institutions of the country where the poor are called "paupers," and where the sick are regarded as mere "cases" and as so much "material." In these great institutions the paid officials and retainers serve over long periods of time, and they become calloused and indifferent to suffering. They come hourly in contact with the lowest order of human beings, men who are vicious, ignorant, and unappreciative, and women who are worse, and it is into such an atmosphere that these young people are thrown without the experiences of life behind them. Is it any wonder that they accept the attitude of those about them, and assume the same manner toward the patients? And, if such is the atmosphere that pervades the large charitable institutions of this country, there is a far worse atmosphere in the great hospitals of Europe, where there are practically no nurses with training as such, and where, in almost every case of obscure or interesting pathology, there is a latent, if not expressed, hope in the minds of the professional men that they will eventually have the pleasure of confirming their diagnosis in the postmortem room.

Such an atmosphere is not one calculated to train the young physician in humanitarianism, in courtesy, in delicacy of feeling toward those who are suffering and in distress. On the contrary, the best atmosphere within which these young gentlemen may begin their professional lives with the greatest possible hope of return is the hospital in which the higher requirements of studentship are exacted, in which the patient is regarded as a human being, in which humanitarianism is a confirmed habit of thought, and in which the free patients are regarded as upon

exactly the same level as those who pay the highest fees for their service. Amid such surroundings as these the young medical man may hope to have his sympathies aroused rather than deadened. He may hope to realize a state of mind that will make his profession a mission of mercy. There are some physicians who regard it as a sacred privilege, almost, to be with their patients when the end comes, so that they may console and sympathize with the family, and perform those little, trivial, but important, services which, if they do not render death less terrible, at least make it more bearable to those who survive.

These thoughts are the structure upon which successful internship should be built; a young man in the hallowing influences of a humane, sympathetic environment need not feel that his conduct toward his patients in after-life will be anything but proper; his bearing could not well be coarse or brutal, and one of the greatest satisfactions that can come to the high-minded physician is a feeling that his people venerate and lean upon him in their hours of suffering.

In the institution it should be the duty of the interns to remain on their wards at all regular visiting hours. They ought to be there for the purpose of giving information to the friends of patients, and thus, too, they will learn how to conduct themselves with the friends of patients. The responsible relatives have a right to know the condition of a father, mother, or sister, and, if the story the intern must tell is a sad one, he will soon learn how to tell it so that the heavy blow will not fall too suddenly when it is too heavy to bear, and thus, again, he will get one of the most profitable lessons for his career when he leaves the institution.

It is in the attitude of the intern toward the private patients of a visiting physician that the greatest delicacy will be required. The intern is not the physician—he merely represents the physician as an assistant, and his bearing in the presence of his senior should be one of the utmost loyalty and one of perfect confidence. Perhaps he may have misgivings as to the diagnosis that his senior has made, the course of the disease, and the treatment, and it would seem that he has a right to express this doubt to his senior, but certainly not to the patient or the patient's friends.

Perhaps this pendulum may swing too far the other way with some young men; there may be a tendency to become more than properly intimate with the patients of the visiting physician; they may arrogate too much to themselves in the treatment and care of the patient, and thus raise a doubt in the mind of the patient or his friends as to whether, after all, the intern is not the better doctor of the two. This has been known to occur. Interns should be quick, courteous, sympathetic, and, above all, businesslike in their dealings with the private patients of their seniors. They should visit the sick room as often as duty calls them. They should stay while it is their duty to be there, and they should immediately leave when that duty is accomplished. It is no part of the duty of an intern to visit a patient in the hospital socially, to sit with the patient's friends and relatives; such conduct is disloyal to the attending physician, and no honorable intern will be guilty of it.

In the course of his dealings with visiting physicians in the institution the intern will have occasion sometimes to so gravely question the ability of his senior in a given case, and so seriously doubt the correctness of his views regarding the patient, that it will be his duty to confide his doubts and misgivings to his closest superior, the superintendent of the institution, who, in some such way as may best suit the purpose, will ascertain for himself the correctness or incorrectness of the young man's judgment, and take proper action to safeguard the patient's best interests; but these misgivings should never be confided to another visiting physician under any circumstances whatever, and the wise intern will never discuss the conduct

of one physician with another. These men are on competing ground in the hospital, their interests clash, their ideals are sometimes sordid, their motives sometimes selfish, and one may never know when a casual remark of an intern, suggesting a weakness or failure on the part of the physician, may not be used to his detriment by another.

Relation of Interns toward Each Other.—An *esprit du corps* in an intern staff is a guarantee and forerunner of successful work; the want of it stands for failure. These young men have not always the best judgment, as they have not had broad experiences of life, and too often they may feel that their success must be purchased at the expense of some one else in the brotherhood. The contrary is true. Where there is a fine spirit of comradeship and mutual helpfulness better work will be done, a broader education will be attained, and a worthier maturity for the young men will be the result. The intern who adds one atom to the sum of common knowledge helps his fellows not alone by the one idea that he has offered, but the mere fact of his keenness has put his fellows upon their mettle and thus sown the seed of ambition and emulation, and a full harvest of achievement will result.

On the other hand, if there is a selfish secretiveness, each man hiding and holding what he gets, no one helping any one else, there will breed a narrowness, a want of progressiveness, and the whole corps will suffer. Not alone will a broad spirit of helpfulness in the corps redound to the credit of the men in after years in a greater knowledge of the science of medicine, but for their temporary purposes; their comforts will be greater, they will have more pleasure in their work, they can relieve each other for recreation, do each other's work on occasion, to the end that the whole corps may have a freedom of action that will allow them to keep outside engagements freely, because, having unselfishly helped an intern friend, they will be free to call upon him for service in kind.

By-products of Internship.—It is not enough that young men shall be trained in the practical essentials of their profession in the hospital; that they shall be broadened and ripened in the humanities and started upon the way of world knowledge. It is equally incumbent on the hospital to drill and train them in the art of study, and teach them how to meet their fellows of the profession on the rostrums and in the pages of the periodicals. Medical men are not measured wholly by what they know, but by what they can tell of what they know. Therefore interns should be taught to search the literature, to prepare papers on live subjects, and to read those papers and be prepared to defend them in gatherings of physicians.

An excellent way to do this, and one in use in at least a few of the large hospitals, is to organize the intern corps into an institution clinical society. This society should meet at least once or twice a month on regular and fixed dates, and should be conducted by some medical man of experience connected with the hospital, preferably the director of the laboratory of pathology. This permanent president should apportion out the dates, make the programs, aid in the preparation of the papers, and generally act as mentor of the corps. Usually the visiting staff men in the different services will be able to suggest pieces of original work for their interns, based on a case or a series on the wards, and the attending physician will always be glad to direct the search of the literature and the subsequent preparation of the paper. There will be some one always at hand on the medical staff who will edit the paper for style and composition. The director of the seminar or society should personally see that the writer has covered his subject in a way that will make the paper a credit to him and to the institution. The medical journals will always be glad to publish such papers if they are really worth while, and by the time he has finished his internship each member of the corps will have introduced himself

in the literature of his profession, and his reprints will be his best introduction to the medical men in the community where he settles down to practice.

These intern meetings can be made so popular that members of the attending and consulting staffs will attend them and take part in the discussions. To add to the interest, each meeting may be started with a demonstration of cases from the wards, the interns presenting them. The attending men of the services will always be glad to lead the discussion of their own cases, and in this way the interns are thrown into the maelstrom of active debate with their seniors, and they will learn to talk extemporaneously and on their feet.

In Europe it is the practice for the assistant or intern to sign the paper for publication, and to credit the work to the service of Professor So-and-So of blank clinic. If this is done, the head of the service is at once enlisted in behalf of the paper, and he will want it to go out in a creditable condition. The societies benefit the hospital, the patients, the attending staff, but, above all, the interns.

Rules for Interns

All the foregoing discussion upon the subject of interns focuses upon a few fundamental rules of conduct. A set of these rules is appended as seeming to meet the necessities for almost any occasion in intern service:

RULES FOR THE HOUSE STAFF

1. The number of house physicians shall be fixed by the board of directors, and may be changed from time to time as the exigencies of the service may require.

2. The term of service for members of the house staff shall be two years, but the board of directors may terminate the service of any member at any time, either because of any delinquency on the part of said member or in the interest of the service of the hospital.

3. Members of the house staff shall be chosen each year by competitive examination, the details of such examination and the eligibility of candidates to be fixed arbitrarily by the board of directors.

4. Before entering upon their duties, each member of the staff shall subscribe to the following obligation: "This is to certify that I accept the position of member of the house medical staff of the ..... Hospital, that I have carefully read the rules and regulations of said hospital, and that I will carefully abide by them and by any other rules and regulations properly authorized during my term of service."

5. Members of the house staff shall be divided into juniors and seniors, serving one year in each capacity, unless otherwise assigned by the board of directors or the superintendent of the hospital.

6. At the close of their service, if the same has been satisfactory to the board of directors, each member of the staff shall be awarded a diploma, signed by all the officers of the board of directors, by the members of the staff committee of the board, and by all the members of the conference committee of the medical staff.

7. *Duties of Juniors.*—During their junior year members of the house staff shall be under the immediate direction of the senior in the particular service in which they are engaged, and shall further specifically perform the following duties: (*a*) Take and record minutely and carefully the history of each patient as soon after his or her admission to the hospital as the exigencies of the case will permit, but, in any case, within twelve hours after admission; (*b*) personally see that all data, including the necessary laboratory findings, are obtained for the information of the attending man in the case at the earliest moment possible; (*c*) make daily additions to the history of each case, recording any new developments, as indicated by the attending man or the senior in the service, and describing in detail any operation that may have been performed, with the full names, and, where possible, the addresses, of every person who was present at said operation (excepting the nurses); (*d*) he shall do any and all dressings that may be required of him by the attending man or his senior; (*e*) shall accompany on the rounds of the hospital such attending men as may require such service, and shall note on the record sheets of each patient visited, at the time of the visit, such orders as may be given by such attending men, and in any other cases required of him by the superintendent of the hospital.

8. *Duties of Seniors.*—Senior members of the house staff shall be responsible for the exact carrying out of all orders of all the attending men in the service in which they are engaged, shall report to the superintendent of the hospital any negligence or deficiency on the part of their

juniors or the nurses in the cases under their charge, and, either personally or by their juniors, shall accompany all attending men on their rounds of the hospital, unless such attendance is specifically excused by the attending man in any particular case; they shall assist the attending men in all operations, unless specifically excused in any particular case. In the absence of the junior, or when the latter is properly busy with other work, the senior will personally make blood-counts and pressure, establish the Widal, make urinalysis, or shall see that such data are furnished for the information of attending men.

9. No member of the house staff shall perform any surgical operation or anesthetize any patient, except in the presence of the attending man, without the specific consent of the superintendent of the hospital.

10. Members of the house staff shall be in their wards during visiting hours, from 2 to 4 on Wednesdays and Sundays, for the purpose of protecting patients from undue annoyance on the part of visitors, to answer such reasonable questions as may be put to them by anxious relatives and friends of patients, and to assist in the preservation of order and decorum in the hospital. This duty shall be mandatory during the whole visiting times specified, unless specifically excused by the superintendent of the hospital.

11. Each member of the house staff may be absent from the hospital one afternoon and one evening each week, the afternoon hours to run from 1 to 6 o'clock and the evening hours from 6 to 12, afternoons and evenings to be fixed by the superintendent from time to time, as the exigencies of the service may require; provided, that no member may exercise the privilege of absence under this clause at any time when he has a dangerously sick patient under his care, or an impending abnormal obstetric case, without the express consent of the attending man in such case, or the consent of the superintendent of the hospital; further provided, that no senior and junior in any one service shall leave the hospital premises at the same time without the express consent of the superintendent of the hospital; and further provided, that no such absences will be permitted during the regular visiting hours without the consent of the superintendent. Before absenting himself, each member shall sign "out" in the book kept for that purpose in the office of the superintendent, writing plainly, and in its proper place in the page, the precise time of leaving, and the precise time he expects to return; where possible, a telephone number must be given by which to locate the member in case of an emergency. Upon his return each member shall sign "in" with the precise time of his return, in the space provided for that purpose; but he will not erase any previously written data.

12. Members will assist in every way to preserve silence, order, and decorum in the hospital; they will wear rubber heels upon their shoes, refrain from loud talking and laughing; and, in their own quarters, will make no noise that will penetrate to other parts of the hospital.

13. Members of the staff will be expected to observe the strictest decorum and the utmost courtesy toward the nurses in the service, and to limit their relations to the nurses within strictly professional bounds; any deviation from this rule will be sufficient for instant dismissal from the institution. They shall not prescribe any medical or surgical treatment for any nurse, except upon the express request of the superintendent of the training-school.

14. Members of the staff will bear themselves with courtesy toward their fellow-workers in the hospital, and, to this end, will address all attending men, the superintendent of the hospital, and the nurses while standing, and will continue standing unless requested to be seated by the person with whom the conversation is taking place.

15. Members of the staff undertake to give their undivided services to the .... Hospital in return for the professional experience they hope to acquire; being thereby fully compensated, they shall not practice their profession to any extent whatever except for the hospital, and shall not accept any fee or emolument of any kind for such services from any one whatsoever, either directly or indirectly. And, under no circumstances, will a member of the staff perform any professional service for an attending man outside the hospital, or remove any instrument or piece of apparatus from the hospital for such purpose, without the specific consent of the superintendent in each case.

16. Members of the staff are expected to keep in constant touch with their attending men, to take all their orders concerning the care of patients from them, to communicate to them any untoward or unexpected development in any case at once, and failing to find such attending man or men shall report such developments at once to the superintendent of the hospital. Immediately upon the death of a patient, the senior in charge of the service in which such death occurs will report such death, in person, to the superintendent of the hospital, and as soon thereafter as possible shall communicate the facts to the attending man in the case, taking his orders as to the signing of the death certificate and cause of death, as to whether it is the desire of the attending man to himself sign the certificate, or direct the member of the house staff to do so, the member of the house staff will thereupon proceed immediately to carry out such orders.

17. It is expressly forbidden for any member of the staff to disclose to any outsider, or for the benefit of any outsider, any part of the record or history of any patient of the hospital, past or present, or to discuss any such patient's case with any outsider whatsoever; provided, however, that this clause will not prevent any member of the staff from informing any relative or immediate friend concerning the state of the patient's health, the likelihood of recovery, or the reverse, or to prepare such friend or relative for impending death.

18. Members of the staff shall not enter the private rooms of the hospital, excepting where they are in specific attendance upon the occupant, and will, under no circumstances, discuss the

diagnosis or prognosis of a case, either with the patient himself or with a friend or relative of any private patient, except upon the express request of the attending man in the case; and no member of the staff shall hold any social intercourse with any patient in the hospital without the express consent of the superintendent.

19. No postmortem examination shall be held in the hospital except upon the written consent of the superintendent, after having the consent of the nearest relative, and in any case when any such postmortem is performed by any member of the house staff, such written consent of the superintendent, and the postmortem findings in such case, shall become a part of the record of such case, and be filed with such record.

20. Any violation of any of these rules will be sufficient to warrant the instant dismissal of the offender.

THE MODERN TRAINED NURSE

THERE seems to be something radically wrong with the trained nurse of to-day—the medical profession says there is something wrong; the thinking women at the head of training-schools say there is something wrong; and the lay public finds something radically wrong. Not all of these elements agree as to just what the trouble is, in fact, they all seem to differ.

The doctors say the nurses who are being graduated from the training-schools are not efficient, and a great many thinking members of the medical profession say that the nurses are being trained to too fine a point, but not in the right direction. The heads of training-schools think the nurses are not being sufficiently trained. The public does not seem to care to analyze the situation, but merely finds fault with the nurse as an individual.

Let us see if we cannot agree first as to a diagnosis of the case, and, in order to do so, let us have a history, so to speak.

It is not so many years ago since there were no women nurses. Up to a century ago nearly all nurses were members of the religious orders. These good men and women presided over the hospices of Europe, and took the best care they knew how of the sick wherever found. At a later day, when conditions made it necessary for the people to create independent hospitals, a new class of nurses came into existence—educated, more or less cultured, kind-hearted, but erratic men, whose dissolute habits prevented their success in any permanent occupation, and who wandered about the world from place to place, nursing the sick between their periods of debauch. These men acted at once as nurses and assistant physicians. Many of them were graduated medical men, expert in the practice of their profession, and one here and there occasionally pulled himself together, settled into a well-ordered life, and became a prominent physician in the locality where he lived. The few women nurses of that day were of the Sairey Gamp order.

The Crimea and Florence Nightingale, and not long afterward the American Civil War and that host of patriotic women who went upon the battlefields to nurse the sick, gave an impetus to the profession of nursing by women. It became a fad for young women of culture and refinement to nurse the sick in the slums and in the hospitals without compensation; and, by an easy evolution, the fad of nursing grew into a definite profession; training-schools were organized, and young women were taught how to nurse the sick scientifically and efficiently.

Nursing in that early day was not what it has come to be. There was no pathology worth the name. Almost nothing was known about the chemic and physiologic constituents of the blood, the urine, the various excreta, and the tissues of the body. Much medicine was used, and trained nurses were taught to give this medicine intelligently, to feed the patient with what the doctor ordered, and to look after his personal comfort. These things were enough in that day, because they met the demands of the medical profession. The doctor himself knew no more. But even in the time that we are now contemplating the work of the women nurses was supplemented by a considerable amount of service by male nurses, especially in surgery.

Then came antisepsis, with somewhat technical demands, and, following the discoveries of Koch and Pasteur, Billroth, and Virchow, there came about an era of pathology, simple, it is true, as practised in the hospitals and at the bedside of the sick, but at least a beginning. As this technical work grew, the trained nurse went along in the old way, participating not at all in it, and there came a time eventually when the members of the medical profession, finding their demands not otherwise met, surrounded themselves in the hospitals and in private practice with young physicians just out of the schools, who could give them what the nurses could not.

This survey brings us down to to-day, when the hospitals all over the country are getting their professional technical nursing done by young physicians whom we call interns, and the nurse goes about her business in the old way, with a smattering here and there of technical knowledge, which usually proves the old axiom that a "little learning is a dangerous thing."

It is held by some of the foremost exponents of trained nursing, as practised in the training-schools of to-day, that hospitals are not maintained as places in which to care for the sick and to cure their diseases, but places in which to train young women to do efficient nursing out in the world of private practice. If this is true, which may be safely questioned, then it would seem that the duty of the trained nurse must include the performance of at least the simplest forms of technical work that the doctor of to-day requires, such as the taking of a blood-count, the making of a urinalysis; but no nurse does this. It must be done by an intern who is being trained to do these things for his senior, and who later must do them for himself.

Comparatively little medicine is given to the sick nowadays. The physical comforts of the patient require so little of the time of the nurse who is taking care of him that it would seem almost as though her office is coming to be a sinecure, which will not be tolerated indefinitely, and a new adjustment of the whole situation must come. If the newly graduated medical men must continue to perform practically all the technical service for patients, then an attempt is being made to teach the trained nurse things that she will not have use for, and she must relegate herself to a far simpler office, just above that of the menial or maid of all work. If she is to take some of these offices off the hands of the physician, she must be taught to do the work in a workmanlike manner, which she isn't taught to-day.

Perhaps another adjustment is possible, that there can be two classes of nurses, one made up of young women of education, culture, and refinement, whose mental equipment and preliminary education will make it possible for them to learn the needful things of their calling; and the other class, made up of well-disposed young women of excellent intention and limited education, whose curriculum can be limited within their mental possibilities, and that will enable them to give a certain amount of very primitive care to the sick.

If this radical judgment of the status of the trained nurse of to-day is not actually conceded by those well-informed women who lead the thought of the modern training-schools, at least it is tacitly admitted in their construction of the modern curriculum, which not one pupil in a hundred in the training-schools can by any possibility master. The builders of these curricula feel within themselves that the training-schools are not living up to modern demands, and they are attempting to correct this fault by setting up courses of study that would fill the want, but their pupils cannot measure up to them.

There are one or two reasons why this situation exists in the profession of nursing. The chief one perhaps is the tremendous growth in the humber of hospitals, and the

St. Bartholomew's Hospital Trained Nurses' Institution,

WEST SMITHFIELD, LONDON, E.C.

(Telegraphic Address—"RAHERE, LONDON.")
Telephone No. 981 Holborn.

Under the Management of the Governors of St. Bartholomew's Hospital.

The Institution is under the direct supervision of the Matron, and supplies to the public, on the following terms, and subject to the undermentioned regulations, thoroughly competent Nurses who have trained in the Wards of St. Bartholomew's Hospital, viz. :—

For all Medical and Surgical cases, except those mentioned below....	£2	2	0	per week.
For cases in which Massage is done by the Nurse	2	12	6	,,
For Alcoholic and Nervous cases requiring special application or methods	2	12	6	,,
For cases of Scarlet Fever, Diphtheria, Measles, or any other infectious or contagious disease	2	12	6	,,

NOTE.—After attending any such case, the Nurse must be thoroughly disinfected before her return to the Institute, and will not be available for duty during the incubation period of the disease with which she has been in contact. A charge of *Half Fee* will be made for this period.

For *all cases outside the United Kingdom* (unless the Nurse accompanies the patient from England, when the fee will be the same as if the patient remained in England)	3	3	0	,,
For attendance on Operation for one day or part of a day	1	1	0	

NOTE.—Nurses sent to Operation cases will, if required, be provided with a Box containing the necessary sterilized appliances, &c., for which an additional charge of One Guinea will be made.

In addition to these charges the Nurse must be paid her travelling expenses, and an allowance of 3s. a week for washing, and if she is asked not to dress in uniform, an additional fee of 10s. 6d. a week must be paid.

The foregoing charges are made for each week that the Nurse is employed.

constantly growing demand for trained nurses in private practice. There are not enough young women of education and gentility to meet this demand, and consequently recruits must be drafted from an inferior class mentally, and, alas! sometimes morally. Those of us who are familiar with the world of private nursing in the homes of the well-to-do sick are quite aware of how far the average nurse falls short of meeting the expectations of her employers and the attending physician,

(Reverse of the card).

1. On the Nurse's engagement a week's payment must be made in advance, and during the time of her engagement the weekly charges for her services will be considered as due and payable at the end of each successive fortnight after the first week.

2. The Nurse's fees must be paid direct to the Sister of the Institution.

3. No one may retain a Nurse for a longer period than two months without the special permission of the Matron. The Matron is at liberty to withdraw or change a Nurse at any time if she should deem it expedient to do so.

4. It is requested that at least twenty-four hours' notice of the intended return of a Nurse may be made by letter to the Sister at the Institute, and that if the Nurse is at a distance from London, she may be allowed to return by an early train.

5. Nurses are strictly enjoined to carry out most carefully the instructions of the Medical attendant, to attend to the wants of their patients, to perform any office that the nature of the case may require, to see that everything is clean for the patient's use, and to keep the sick-room neat and properly ventilated; but they are not to be required to do the work of house servants.

6. Nurses are also enjoined to hold sacred the knowledge they obtain of the private affairs of the family in which they are engaged, and to adapt themselves as far as possible to the usages of the family.

7. It is particularly requested that in order to ensure the efficient performance of her duties, every Nurse be allowed to have, in the course of each twenty-four hours, at least seven consecutive hours' rest out of the sick-room; also that it be arranged for her not to take her meals in the sick-room or with the servants, and that she be allowed to have daily at least one hour's outdoor exercise.

8. If the condition of the patient will permit of the Nurse's absence, she should be allowed to attend Divine Service once every Sunday.

9. The Nurse may not be sent to sleep out of the house where she is nursing except by the permission of the Sister.

10. Nurses must wear their uniform indoors during the whole time of their attendance on a case, unless other arrangements are made with the Sister.

N.B.—Under special circumstances, and by previous arrangement with the Sister of the Institution, half-fees may be charged for any part of a week not exceeding three days; for any time beyond three days, full fees must be paid.

and the heads of the training-schools are constantly annoyed by serious complaints from private homes that the members of their alumnæ are not satisfactory as nurses. Perhaps at least a partial cure for the unsatisfactory situation in the profession of private graduate nursing is due to the fact that the training-schools and the alumnæ associations have no control or disciplinary power over their mem-

bers. England has a lesson for us in this regard. Over there graduate private nurses are attached to the hospitals, and a physician wishing to employ a private nurse must telephone to the hospital for her—make all of his arrangements with the hospital—he must pay the hospital for her services at rates printed on a regular rate card, a card which states specifically what the charges are for, and the hospitals, under these conditions, undertake to satisfy the physician as to the capability of the nurse they send him. Individuals among the lay public who have had to employ nurses in the large English cities report what is evidently a much better situation over there than on our side of the water. This card is a most interesting exhibit just now, and is reproduced on pages 306 and 307.

This much cannot be said of the nurses on the Continent, and we have nothing to learn of value from any of the continental countries in this respect.

If there is any question about the justice of these criticisms, let the inquirer undertake to find a trained nurse from any school who knows the first principles of a hospital dietary, or who can tell the most elementary facts about infant feeding and milk formulation, excepting in the same way that the nursery maid knows these things; or who has the slightest knowledge of hydro- or electro- or physico-therapeutics, or who can make a urine examination that a modern physician will accept, or a blood-count or a hemoglobin determination, or take a blood-pressure. And yet the curriculum of the smallest and most inconsequential training-school in the land advertises these subjects as a part of its course of study.

All these forethoughts are so self-evident, and they are so familiar to the progressive members of the medical profession, that it would seem almost redundancy of language to prosecute this phase of the subject further, excepting to merely insist that what has been said here is not in the spirit of unfriendly arraignment, but rather for the purpose of calling attention to glaring deficiencies in hope of improved conditions. And this brings us back again to the thought that perhaps the near future may develop a necessity for two grades of graduate trained nurses, just as there are to-day the graduate nurse and the so-called "practical" nurse. If that day shall dawn, the humbler, less highly educated girl will be trained to care for those cases of illness that do not require much technical nursing, but rather conscientious adherence to the simple orders of the doctor, while her more gifted or better educated sister is trained to a higher degree of efficiency for the performance of a good many of the technical services that now fall to the hospital intern and the busy practitioner's young medical assistant. The signs of the times would seem to point rather this way, because young medical men, every year and in all the schools, are being taken further and deeper into the mysteries of the microscope and into the fields of empiricism, leaving them less and less time to perform duties that after a few weeks of their doing become mere routine drudgery. It may be argued that if there are young women who have a capacity to receive a training that will enable them to take over what are to-day the duties of the intern, why are they not fully equipped to go a step further, and enter full fledged into the medical profession? Some of them will enter there; but it must be remembered that medicine is growing harder all the time, not merely on its mental side, but from a physical standpoint as well, and it must be already noted that more young men each year are finding the pace too fast, and are dropping out before the preliminary test of the school is accomplished. How will it be then with young women—not the isolated case of one here and there, but with a class sufficiently large to make an impression on the times? And it may be hoped, in the interest of society, that no considerable number of young women, at this necessarily early period of their lives, will premeditatedly forswear the eternal law, and assume obligations that will require

many years of arduous intellectual toil to accomplish, to the utter casting away of the woman's God-given destiny.

If the day shall dawn when nurses can be divided into two classes by reason of their fundamental differences in preliminary training, that is, primary education, it would seem not a very difficult task to fit the less highly educated girl for the office of nurse for the patient who needs only the ordinary creature comforts, kindly ministration to his or her physical wants, and conscientiousness in the carrying out of the doctor's orders, and to fit the more highly trained young woman to be the assistant to the doctor in the more exacting cases where technical skill is required, to fill the many teaching positions in the training-schools and hospitals that are now most indifferently filled, and to take the superintending of the hundreds of small hospitals now operating and the thousands that must be built and operated in the near future.

To one versed in the already intricate hospital technic of the day, it is hardly conceivable that both these classes of nurses can be trained together in any one school or hospital for obvious reasons, but might not the great charity and public hospitals undertake to train the practical nurse; and the more expensively conducted private and mixed hospitals, with comfortable endowments behind them and a higher class of patients for their patronage, be charged with the training of the higher order of nurses?

Preliminary Training of Nurses.—Let us leave now the broader question of what the modern nurse ought to be, and what she must be if she is to succeed in the future, and discuss briefly the requirements of the candidate for admission to the average training-school under the scheme of education practised at the present time.

Nearly all training-school catalogues and the literature sent to candidates calls for a high school education or its equivalent as a prerequisite to admission. Almost no training-school in this country actually does require such preliminary training; but should the candidate, in filling out her application blank, state that she has had a high school or normal school education, she is accepted almost without further examination. It makes little difference whether she is temperamentally fitted to be a nurse, whether she has that rather rare commodity among young women, good common sense; whether she is steady, has good morals, and a clean mind, as indicating her home breeding. Some of the most conscientious graduated nurses and pupils in training are young women who would scorn to tell a lie, and who would admit frankly a mistake if they made one; some of them have hardly a grammar school education, many of them have been maids and family nurses for small children in private homes, and have studied their primary arithmetic, reader, and speller after the children were in bed at night, and have thus prepared themselves for reading the thermometer, for taking the temperature, pulse, and respiration of the patient, and for recording these upon the nursing sheets of the institution which they hope to enter. If the status of the nurse is to remain where it is now, such girls as these, if they have common sense, a sense of responsibility, trustworthiness, truthfulness, and honesty, will eventually make far more capable nurses and be far more useful to the doctor than the girl who has had a much higher training in the schools and colleges, who cannot be relied upon, who has not good common sense, and who is irresponsible in her own attitude toward the serious life she is setting out upon.

Age and Temperament of Applicant.—The age of the applicant is an item in which it may be suggested we have gone astray somewhat. Generally speaking, the catalogues of training-schools announce that candidates must be from twenty-

one to thirty-five years of age. Are not these ages too extreme at both ends? Many young women eighteen years of age are plenty old enough to take the training for a nurse. The discipline, the habits of application, and industry inculcated in the training-school are quite as good, it would seem, as any other school for a young girl; her contact with life under conditions imposing restraint is good for her; things as she will see them are real, and not what they seem to the average school girl. She faces facts, and not dreams. She sees the tragedies of life, and learns, in object lessons in the wards of the hospital, how many of these tragedies are due to human weaknesses and indiscretions, and the very closeness of her contact with these tragedies will be an inspiration for her to take other paths in her life.

If she is a happy, gay-hearted girl there are many of the comedies of life in the training-school and not a few of the sunshiny spots. She associates with girls of her own age, most of them serious, wholesome-minded young women, else they would not have sought admission to so serious a profession. She has plenty of time for wholesome recreation; in a word, the pupil in the training-school of a hospital sees the world at its best and at its worst. If the girl of eighteen finds at the close of her course of study that she does not want to nurse, and thinks she is better fitted for a wife and mother, then who shall complain? She has given three years of good honest work, efficient and valuable, in exchange for a good education. She owes no one, she has earned it, and her husband and her children will be the better for her having received it. So let us set back the age at which girls may enter a training-school, set it back as far as the character of the girl will permit. And perhaps we may compromise with those who survey the whole problem of nursing from another attitude than that assumed in this section, by proposing that we take these young girls and give them a year of preliminary education, an education that will lead them toward the goal intended, without introducing them at all to the wards of the hospital, leaving two or more years for the practical training of a nurse, just as the universities are giving to young men and young women some years of preliminary training that lead toward a profession or science, without taking them into the holy of holies of that science, so to speak, and thus leave them the option to set a new course, if they so desire, without having missed a comprehensive education for other walks in life. Boston does this to-day, giving an elective course to high school girls to fit them for entrance to the foremost training-schools.

Now let us go to the other extreme—thirty-five years. It may be doubted if there is a woman in the world who arrives at the age of thirty-five years, who is yet sufficiently supple minded to take the discipline and self-discipline of a training-school profitably, whose mental make-up is yet so elastic that she can accommodate herself to an environment radically changed from the course of her previous life. Ninety-nine times out of one hundred the woman over thirty who applies for admission to the training-school does so because of social or domestic disappointments, and who shall say in what proportion of this total number these disappointments have served to sweeten, instead of souring, the life and character? To such women the training-school is merely a choice of evils. Many of them are nervous and under the exactions of the training-school become more nervous; and another great number are women whose lives have been misdirected, and who fall into the new place with a protest on their lips and in their hearts. Is it possible for a woman like this to give charitable care and attention to a sick child, a sick woman, or a sick man?

We see so few women past thirty who began the career of a trained nurse, and who fell in with the life successfully, that we are constrained almost to take the

broad ground that women over thirty are unfit for admission to a training-school. Of course, it goes without saying that married women—divorced or separated from their husbands, with perhaps divorce in the background—are not proper probationers for a training-school. They are self-centered; their interests are elsewhere; in their own minds at least they have been abused, and they are unable to devote themselves to others to the exclusion of their personal affairs.

In rare cases the widow, if she be young, may become a good trained nurse, but not very often. As a rule, she is too self-centered, her heart is in the past, and her hopes and ambitions are in the future, and one will rarely find a widow of few enough years to be considered eligible for a training-school who has actually determined to cast aside the domestic life; but in this, as in the case of nearly every girl who applies for admission to a training-school, the exceptional girl is the one who will make the best nurse. So that no hard or fixed rule can be made, and the individual herself must be chosen for what she is and not for her class.

Health of the Applicant.—It is needless to say that good health is one of the chief assets of the nurse. No one who is sick can efficiently, patiently, and successfully take care of another person who is sick, and it must be remembered that these girls, when they are admitted to the training-school, are launched upon a three years' apprenticeship, and every safeguard should be thrown about them to see that their time is not wasted. Therefore, it is one of the most sacred duties of the authorities of the training-school to take every precaution to insure the perfect good health of candidates for admission. It is not sufficient that the applicant file a certificate of health from a neighboring physician. In the first place, such physician usually has never examined the girl carefully—that is, heart, lungs, kidneys, stomach, and genito-urinary organs. He has perhaps seen her grow up, knows that she is apparently in good health, and gives a certificate to that effect. The acceptance of every candidate for admission to the school should be conditioned upon the passing of a physical examination, made by some one connected with the hospital and school, who has the time and ability to do this work faithfully. The training-school may be in need of pupils, but an unhealthy nurse is no asset to a school, and it is no kindness to take a girl into the school who has the signs of incipient disease.

Most of these girls have lived pretty even lives: they have not been worked under pressure at their homes, as a rule, and consequently their vitality has not been drawn on to any great extent, so that perhaps they may be apparently very healthy when they come up for admission; but the training is not an easy life, and there are times when it is extremely hard. The girls are sometimes worked to their utmost capacity, and, unless they have the foundation of a robust constitution, and unless their vital functions are in good order, they are almost certain to develop some disease that will make them unsatisfactory for their further training or the after life of a trained nurse. Especially is it necessary to look into the girl's physical condition for signs of tuberculosis and heart disease. A good many of these girls have been brought up in the country with plenty of out-door exercise. As soon as they are shut within the walls of the hospital and herded with sickness of all kinds, it is not difficult to imagine, first, breaking health, and, second, the development of some disease toward which they may have a tendency, either by heredity or by reason of weak organs somewhere.

These girls have usually lived very regular lives as to their food, rest, and exercise. One of the first signs that the training-school is too much for the pupil is a loss of appetite. Being ambitious, the girl makes every effort to hold her own and do her work. She acquires a functional disorder of the stomach, which very often is a prelude to functional heart lesions, which may after a time become permanent

organic affairs. Stomach disorders, to which girls in the training-school are often subject, eventuate very frequently in gastric ulcer. Just why this is the case may be left to the medical profession. We are only interested just now in the fact.

These girls very frequently have incipient eye diseases. Very often their teeth are in bad order, and not infrequently their menstrual apparatus is in the worst possible condition. It is a peculiar fact that many pupil nurses have disturbances of menstruation from almost the moment they enter the training-school. The heads of the schools tell us that some of these girls menstruate continuously for months after they begin their training, and some of them have been known to go for a year or even longer without menstruating at all, though they may have had perfect function up to the time of their entering. Just why this is true is another of those mysterious things that we must leave for the medical profession to answer. It is a common occurrence, however, that these girls of irregular menstruation eventually leave the school either because of progressively failing health or from inroads made by some definite disease upon a devitalized system.

So that, again, we come back to the main proposition that it is only justice to the school and the girl that a very careful and critical physical examination be made of every applicant for admission, and it is just a little short of criminal to accept a girl, and disarrange the whole course of her life, until every endeavor has been made to assure her permanence in the career she has selected.

The Training-school in the Small Hospital.—There are some special institutions which cannot possibly attract young women who wish to learn the profession of nursing, as, for instance, a special hospital for the treatment of skin diseases and cancer, or an eye and ear infirmary, where the training would be far too narrow. In all such institutions as these it is almost absolutely necessary to employ young women who have already had their training, and to pay them the salaries demanded by trained nurses. Fortunately these institutions do not require very many nurses, so that the expense of nursing the sick suffering from these special afflictions is comparatively small. They do not require many nurses, largely for the reason that nearly all the nursing in them is of so technical a character that it is done by newly graduated medical men. Just here it might be suggested that if the profession of trained nursing was on a higher plane than it is at the present time, nurses could do this technical work, and they ought to do it. The laboratories of pathology all over the world employ trained women as skilled technists to do special staining and work that requires skilful and well-trained fingers, and that does not require a very great amount of originality. There is no good reason why these special hospitals should not look to the trained nurse for this work also. It is a fact, however, that unless she has a medical education, which presupposes a fundamental intellectual training, the trained nurse is not doing this technical work in the special hospital.

A good many of these special hospitals are attempting, against vast odds, to conduct a training-school, and their failure is evidenced by the fact that all over the country they are attempting to make arrangements for temporary exchanges of pupils with other hospitals, so that the maternity hospital, for instance, may send its pupils to an institution engaged in work in some other direction, and the large general hospitals of the country are solicited continuously to participate in this exchange. If they acquiesce, however, they are giving something for nothing. It would be of little service to a general hospital to send its pupil nurses to a maternity hospital for special training in that branch of the profession, because they have a maternity department of their own, and so with all of the other

branches. So that the special hospital, attempting to operate a training-school, is having a continuously harder time to secure pupils, and, without question, the time is near at hand when they will have to be satisfied with a mediocre class of pupils, who will be so badly and one-sidedly trained at the expiration of their pupil-age that they will be of little value in the community as private nurses. As a rule, there are not enough of these special hospitals in a community or near to each other to make a profitable exchange possible. Besides that, the large training-schools of the country are turning out so many graduates of varied training that the one who has had a training only in one small branch of her profession can hardly hope to succeed in such a one-sided competition. All these special hospitals must sooner or later dissolve their training-schools and work with nurses graduated from other institutions.

Now let us take the small general hospital of, say, 50 beds. The training-school of such an institution will depend almost entirely on the personal equation and the ability of the heads of the institution to devise a competent training for its pupils. There is no good reason why the small hospital should not give quite as good a training to the pupil nurse as the larger one. The relationship between the pupil and teacher will be a closer one, the individualism will be greater, and the few nurses in such an institution, properly conducted by clever women, will bear the same relationship to the pupils of the large hospitals as the young man who is able to afford a private tutor will bear to the great majority of boys who must shift for themselves without very much personal contact with their teacher, and with almost no personal advice, counsel, and direction. It is true that the small hospital will not have so many maternity cases nor so many surgical operations, but it will be a case of quality versus quantity. Attendance on one normal labor, under proper individual direction by a good teacher, a master in his profession, will teach the nurse more than a dozen such cases where the obstetrician and the head nurse pay little attention to the pupil as to the details of her work. The same will be true in the operating-room—in the great hospital there may be twenty cases of surgery a day, in the small hospital two. In the one case, the pupil just entering the operating-room is a very insignificant part of a great machine, and her duty for weeks will be to pick up sponges and hang them on a rack, and to clean instruments at the close of the day's work; whereas, in the small institution she is a large cog perhaps, at once, one of two or three nurses who must do not only the menial labor connected with surgical procedure, but who must at once go into the technic of sterilization, asepsis, the preparation of patients, and attendance upon the surgeon. Again, there will come the quality versus the quantity of the work done, and the success or failure of the nurse in the small institution will depend more largely upon the teaching capacity of those who are responsible for her education than the difference in the number of cases treated in the two institutions.

Unfortunately, it not always happens that the teachers are as well equipped for their duties in the small institution as in the large. The small hospital cannot afford to pay the salary that the head nurse can command in the larger one. The duties of the head nurse or teacher in a small institution are more varied and more exacting, and perhaps the hours will be longer than in the large one, and it too often happens that the head nurse in the small institution has other duties to perform than those directly pertinent to her particular field of action. She may have the institution to look after, or the diet to supervise, or she may even be the purchasing agent for the hospital, and in some cases may be relegated for a part of her time to the office, in the keeping of the accounts and taking care of the ad-

mission of patients; so that, however capable she may be, she will not have the time to give to the proper training of the pupils in the school.

Training-school in the Large General Hospital.—Now let us take up the training-school in the large general hospital. The duties of the pupil nurse in this institution are quite the same as those of the small general hospital, so that when we discuss the one we are quite at the same time discussing the other. If we have anything to offer for the information of the one the same would be true of the other.

At the very outset let us contemplate the relationship of the training-school to the hospital. They are not the same, and in quite a number of institutions within the past few years the training-school has been organized under a separate charter and operated under a different board of directors, and kept in every way completely apart from the hospital, excepting that the pupils of the training-school are employed under certain definite and fixed conditions to nurse the patients in the hospital. Such a dual organization as this makes the ethics of the whole situation far simpler than where the training-school is a part of the hospital and operated in conjunction with it, but the mere fact that a training-school can be operated independently of a hospital is evidence that the training-school is not the hospital. What, then, is the attitude of the training-school toward the hospital, and what the ethics of the situation from the view-point of the hospital and its component elements; that is, the medical staff and the superintendent and the patients? The nurse in the institution, as a cog in a big machine, is not a pupil at all, but a trained nurse, present to perform the specific duties of a trained nurse, and, in so far as her hospital duties are concerned she is answerable not to the directors of the training-school, but to those who are responsible for the care of patients in the institution, and her direction by the superintendent of the training-school, and the head nurses of the various departments of the hospital, are merely for the purpose of the supervision of her work, and to see that she does it efficiently. So far as her duty is concerned in the care of a patient, she is responsible to the physician in charge of that patient, and to the superintendent of the hospital, whose duty it is to see that the patient has all the facilities that the hospital can afford under the doctor's orders. Then the nurse is responsible to the superintendent of the hospital, and the training-school head who ignores this relationship, that is, who assumes that the doctor and the superintendent of the hospital have nothing to do with the conduct of the nurse, is relegating to herself a position of responsibility that does not belong to her. In some institutions there is a training-school rule that a physician who wants to give an order concerning a patient must give it to the head nurse or the head of the training-school. This rule makes it necessary for a doctor's order to go through two or three people, in which case the responsibility for the execution of the order is so finely divided by the nurse, and the head nurse, and the superintendent of the training-school, that it will be extremely difficult to find a culprit if the order is not executed or is improperly carried out. So that it would seem highly proper, if not absolutely necessary, that orders from the doctor concerning a patient should be given directly to the nurse on the case, and it is the experience of most hospital administrators that unless orders are written, and made a part of the record, it is almost impossible to convict any nurse of a failure to carry them out as intended.

It would seem, then, that for purposes of hospital administration the training-school as an entity is practically wiped out, and that the individual nurse is answerable to the individual doctor, and, since the superintendent of the whole institution is placed there by the board of directors to look after the efficient carry-

ing out of all the work of an institution, it would seem that the individual nurse is likewise responsible to the superintendent of the hospital for her share in the care of the patient. Let it not be understood that this dual rôle of the nurse—that is, to the doctor in the care of his patient, and to her superiors as a pupil in the training-school—is an impossible one. In most institutions the relationship works out well, and the superintendent of the training-school is, in effect, the head nurse, charged with the care of patients.

Distribution of Nurses.—The day has gone by when attending men, whether it be in the private pay wards or private rooms or the free public wards of an institution, will be satisfied with a service that contemplates one nurse to fifteen or twenty patients. In the old days, when we knew almost nothing about pathology, urinalysis, bacteriology, and when we did not apply the principles of hydrotherapy and electrotherapy and scientific diet in the care of patients to the extent that we use these things to-day on the wards of every modern, well-operated institution, the duties of the nurses were mainly to wait on the patient and to give the medicine. We are not using very much medicine to-day, and we are doing a myriad of physical things for the benefit of patients, such as tubbing, enemas, wet dressings, irrigations, massage and movement treatment, and the like, so that the nurse, working in the average institution in attendance on acute cases, will do wonderfully well if she can carry out the orders of the modern practitioner of either medicine or surgery for two or three patients for twelve hours at a stretch, and it is almost axiomatic that the institution that employs fewer than one nurse to every two or three patients is not keeping well up in the march of progress among modern institutions for the enlightened care of patients under the demands of modern medicine and surgery. Enlightened public opinion is coming well round to a position in which benefactors of institutions before giving their money will want to know just what care the poor, that they are giving their money to benefit, are actually receiving at the hands of the institution asking for their aid. The best thought in the enlightened community of the day is drawing a very light line between what a wealthy private patient should have in the way of service and the service to be accorded the pauper in the public ward. "The man is sick; take care of him!" These are the words of injunction that will accompany the average pauper to the hospital to-day in the note asking that he be taken in. It will not do to say to this large patron of the institution that this patient requires an *x*-ray picture, but *x*-ray pictures cost money. It will not do to say that this child suffering from the results of a poliomyelitis needs constant and persistent electric movement of the affected part, but that these cost money, and require the undivided attention for hours each day of a nurse or doctor; it will not do to say that this burned child needs the continuous bath, but that the continuous bath calls for the uninterrupted service of a nurse, and nurses cost money, therefore, the child must suffer.

Yet there must be a difference between the service given to a millionaire and a pauper, but that service should be wholly of the luxuries. The pauper need not have broiled quail and asparagus tips for dinner, and he need not have a private room with adjoining bath, with roses on every stand and the odor of perfumes scenting the room; but these extras should be the only ones that the man of millions should have that the pauper should not have; and patrons of wealth and refinement and of humanitarian instincts will give thousands annually to the institution where they know the poor are getting everything that a rich man can get that is needful, where they will give begrudgingly a few paltry dollars to the institution that they know is neglecting the wants and welfare of the poor.

The number of nurses, therefore, is largely a measure of the service given to

its sick by an institution; and no nurse, however capable, can conscientiously give an adequate service to more than two or three acutely sick people.

The Flying Squadron.—In the best-managed institutions, from the standpoint of their nursing corps, there is a sort of "flying squadron"—that is, a certain number of pupil nurses who can be moved at short notice from one point to another: if the work in maternity is heavy, the flying squadron is sent there, to be instantly moved to some other point when no longer needed. The great trouble is that head nurses are too often not taught to do team work, and are not sufficiently encouraged in an *esprit du corps*. If they find it difficult or impossible to get additional help speedily when they call for it, they are very likely to exaggerate their regular and constant needs, so that they can keep enough nurses to be guaranteed against running short-handed when the rush comes.

Training-school Heads.—There must, of course, be a superintendent of every training-school, and what a wonderful woman the ideal superintendent of the training-school is! She should be not only a good teacher, a good administrator, a good nurse, and a good woman; she must be filled with the humanities; she must be an exponent of the "square deal." She must be a good friend and an illuminating example. No woman can measure up to all these things this side the pearly gates, but the best superintendent of a training-school will be the woman who has most of these virtues. She has not only to train nurses; her most important duty is to guide young women at the very outset of their careers along the best lines. Most of the young women who enter the training-school are only half-made women. They are but half-bridled in their moral and mental as well as their physical make-up. It will be the duty of the superintendent of the training-school to mature these young women along proper channels, to teach them good morals, truthfulness, conscientiousness, devotion to duty, unselfishness, to teach them to think less of themselves and their pleasures and comforts, and more of the happiness and comfort of others.

If the superintendent measures up to the virtues that ought to be hers, the training-school will take care of itself. Her assistants will have high ideals. They will be true to her purposes and her conception of things as they should be, and, if the heads of the training-school look high for their ideals, the pupils will not have their eyes toward the ground.

It may be doubted whether the efficiency of a training-school is increased by the too long dominance of one head of a department. Training-school women will say this is rank heresy—that the longer a principal of a department remains there the more valuable her services will be. In the experience of some of us, this is not true. Up to a certain point, the efficient nurse will progress and improve. Her technic will become more and more perfect. Her service to the doctor will become more and more valuable; but, after a certain period of time in one position, the trained nurse regards her work as of a perfunctory character; she ceases to progress; she nearly always slights some of the doctors to give unnecessary attention to others; she ceases to be a good teacher after a while, and, having done the same thing in the same way so long, she expects the new pupil to spontaneously do the thing her way, and when the duty is performed awkwardly or even neglected the director who has rusted out loses her patience, becomes a teacher no longer, but a censorious critic, and too often a common scold. Therefore, nurses ought to change their occupation in an institution. This theory is at variance with the theories held by nearly all training-school women, but it is a leaf out of a book of experience and is honestly set down here.

Discipline in the School.—We have fixed the attitude of the individual pupil

toward the hospital as a nurse, and charged her with duties under the direction of the physician. We go now to the discipline of the training-school, by which the pupil is taught her attitude as a nurse in the world of nursing.

A good many erroneous ideas seem to prevail at the present time, growing perhaps out of a misunderstanding of the nursing problem—the training-school head, on the one hand, may assume that the whole hospital, in all of its parts, is subservant to the training-school as a disciplinary and educational institution for the training of young women to become nurses. The mental attitude of this sort of training-school head toward the patient in the hospital is rather a nonchalant one; the patient is merely a part of the nurse's training—so much material upon whom she may practice; if a mistake is made, costly or otherwise, it is unfortunate, but perhaps a good lesson for the pupil.

The other attitude, sometimes assumed by the hospital administrator, is one that regards the patient as the whole consideration at issue, and is the sum total of the day's work of the pupil nurse. Both these attitudes would seem to fall somewhat short of a just summing up of the status. Without any question the patient is the primary consideration, and the carrying out of the doctor's orders to the end that his patient may get well; but at the same time the care of the patient should be an experience for the nurse and a part of her education. The ideal head of the training-school, therefore, would seem to be a woman whose chief ambition is to take care of the patient, and, at the same time, teach the nurse; the first, by teaching her pupil to obey the doctor's orders, and the second, by furnishing proper instruction concerning the reasons why such orders were given.

The discipline of most training-schools seems to be toward militarism. Pupils are taught to arise when a superior enters their presence. They are taught precedence in entering or leaving a room, and the casual observer on the floors of the general hospital will remark the precision, it might be said the spectacular carrying out of these disciplinary rules. Without any question such rules are valuable. They are valuable in teaching obedience of orders, valuable in pointing out the deference due to superiors, in maintaining self-control in the pupils, and in assuring a certain amount of humility of spirit in young women, who would perhaps otherwise grow sometimes rebellious and impatient of authority. But let us contemplate for a moment a branch of training-school discipline that seems not to be quite so important in most institutions; we might call this training-school politics. Every medical man, whose work keeps him on the wards of a hospital in which there is a training school, understands, to his cost, what training-school politics stand for. It stands for favoritism and injustice. If there is a military discipline in some training-schools concerning the outward show, there is in other training-schools a perfect organization of espionage, in which the spy system is elevated to the plane of a fine art. In this class of training-schools the whole domestic life of the pupil is warped and stunted, and made miserable by the necessity either to placate the spies, who are always known, or to conduct themselves so warily as to hoodwink the spies. These régimes of espionage may be again divided into two classes—first, those in which the spies are set merely to keep the director of the school informed for the legitimate purpose of school discipline; in the other class, the spies are maintained for the purpose of feeding the vanity and personal ambition of the head of the school. It is needless to say this last phase of the spy system is the bane of training-school existence. The pupil has no moment in which she may speak her mind about her superior in that peculiarly harmless, inoffensive way that girls have. She must always guard her tongue even in the abandon of her own room. If she speaks of her superiors it must be done in an adulatory vein. She knows that her

little girlish indiscretions will be carried to her superiors, grossly exaggerated into perhaps heinous offenses, and she knows that the directors of the school, that will permit a system of spying and tale-bearing such as this, are quite small enough and vindictive enough to mete out surreptitiously, and by indirection, a punishment out of all proportion to the offense committed. So that, in such a school as this there must always be built up a counterplot. The pupils become habitual sneaks and liars and sycophants. These girls are getting their training in this school, not only as nurses, but as women, and if they are forced into petty vices, are driven to insincerity, it is an easy stage to the next step which carries these same petty vices into the care of the sick. The girl, a part of whose training this is, will find it easy presently to record a temperature not taken, to mark down a medicine not given, to omit some order of vital importance, and to record it as having been carried out.

In every walk of life the keynote of the education of the young is the lesson in truthfulness, honesty, sincerity, and so it would seem for the pupil in the training-school; if she is taught these virtues, and if they are inculcated as a part of her daily life, they will eventually be a part of her very nature.

The Teaching of Probationers.—We have now considered somewhat the training of the pupil nurse in morals and manners, in her social and domestic life, and in the molding of her character. Let us now briefly discuss her training in those things that appertain especially to her vocation—that is, the care of patients.

Without any question, the days of primest importance to the pupil in the training-school are those of her probation. She is clay in the hands of the potter; she doesn't know what is expected of her, and has no sense of the proportions of responsibility; she cannot know where her duties begin and those of other people end, so that it is the very alphabet of her profession that she must learn immediately upon entering the school, and, in order that she may learn her first lessons well, she must have a good teacher; it is essential that every woman in authority over pupil nurses shall be efficient and patient, and, at the same time, have the knack of imparting what she knows to others. But the teacher of probationary nurses must be the one woman in a thousand. It is common knowledge in training-schools that the pupil does not develop her true character until after she has been accepted into the school. The reason for this is evident: she is on her very best behavior. If there is a question between two lines of conduct, the one active and the other passive, she chooses the passive, because it is almost certain that that course will at least keep her out of trouble. She is anxious to please. She does not know how to do so actively, so she assumes a humility and timidity that is artificial, and unless she has a teacher of keen discernment, who can read beneath the surface and who will study the individual in order to direct her properly, the girl will get a bad start in the school.

In the later training of the pupil nurse she will have a number of teachers, those who will direct her work at the bedside, and those who will teach her the theories of her profession. At the outset there should be one teacher, who should be a mentor or tutor, and who should direct her every step. The ideal way to teach these young women at the very start is to take them into the wards and let them watch the older pupils do their work. The teacher must be present, explain why things are done so, and in doing her first work the pupil must not be clothed with any responsibility; that is, if she is asked to place a bed-pan, it must be understood that it is solely for her practice, and has nothing to do with the patient's comfort or wants; she becomes less nervous under such conditions. This is the plan of teaching little children—the object lesson method—and it will be astonishing how much

even the dullest pupil will learn in a few hours under the proper direction of a careful teacher, and she will learn to do things right at the very outset, and she will never do them wrong afterward. In this way she can be carried through the wards and into every detail of ward work; she can be taught in a few hours, or at least a few days, the use of every piece of apparatus—hot-water bags, enema outfits, the making and changing of the bed while the patient is lying on it. In a few days, with this kind of direction, the young nurse can be made to take her part in the ward work.

If on the contrary the green country girl who has never been on the wards of a hospital is turned over to the businesslike, efficient, and busy head nurse, and is immediately held accountable for wrongdoing, she will get nervous, learn things wrong, and it will be a long time before she ever gets them right. There are very few head nurses who are worth very much as trainers of beginners; as a rule, they have little patience with ignorance and inefficiency, their whole minds are on the comfort and intelligent care of patients, and they have neither time nor inclination to stop for explanations, or to show the simple details of a procedure to a slow-minded beginner.

Nearly all of us have seen the probationer go on the ward of a hospital to report to the head nurse, and have seen the girl so nervous at having been clothed with responsibility at the bedside of a sick person that she is utterly incapable of intelligent action.

Naturally, the very best person to assume this intimate initiative direction of the life of the nurse is the directress of the nurses' home; naturally, a graduated head nurse who knows her business. In any event, it must be some one whom the pupil comes in contact with at other times than when she is actually on the wards at work. Perhaps some of us have in our minds such a woman, who will slip into the room of the new probationer at bedtime, with a word of comfort to the girl who is for the first time away from home, who faces the world all by herself, and if this patient teacher will let the girl cry a little bit with her, it will not only do the girl a lot of good, but its effect will be seen in the next day's work in her confidence in her teacher, a sort of motherly confidence as it were. She will have lost her nervousness, because she knows her teacher is her friend, and that her mistakes will not be charged against her, and so she will make fewer mistakes.

The specific duties of the nurse throughout her later life in the training-school will naturally come more properly under the technical operations of the hospital. So much of the nurses' duties are technical, and so much of her work must be done precisely and within rigid lines, that it would seem justified if we take up these duties in a special section on the Technic of the Hospital, and which, at the same time, will cover the duties of the intern and those minor things of hourly performance in the institution.

Theoretical Training of Nurses.—We are interested, not only in what the pupil nurse shall be taught, but quite as much in who shall teach her in the duties of her profession. Many institutions employ special graduate nurses to lecture to the pupils, who hold classes and quizzes and examinations in the various subjects. In other institutions members of the medical staff carry on this work. In still other institutions members of the house staff lecture to the nurses and conduct their examinations and quizzes. Many superintendents of training-schools are at sea over this problem. They find it difficult, if not impossible, to persuade the busy members of the medical staff to lecture to the nurses. In some institutions a few of the more prominent members of the staff, who have a good deal to say about the hospital, in addition to the performance of their own duties as staff members, insist upon the most exclusive right to teach the nurses.

There are advantages and disadvantages in all these various methods. As a rule, members of the attending staff have been out of school so long that it is no longer possible for them to go back to the alphabet of the various branches. It is a rare case where a surgeon, even if he has the time, has the ability to appreciate the mental limitations of the pupil nurse—in anatomy, for instance, and the same will be true of all of the other branches. The teacher who is a master of his profession, well along in years, will almost invariably assume that his pupils know so much of the subject that he begins over their heads, and never gets back to a point where they understand what he is talking about. It has been said about educators that more time is required to think about the teaching of a lesson to a small child, so that the child will understand it, than to prepare a lesson for a member of the graduate class. This will certainly be true in the training-school, and whoever teaches the nurses at the beginning of their course must invariably set out with a quiz and a general discussion of the subject that he is about to begin, in order that he may ascertain just about how much they know of it.

In most training-schools the idea of having the busy members of the staff teach the nurses has been wholly given up, for the reasons that they are too busy to keep appointments with the classes, too busy to prepare the lesson they are to teach, and too long out of school to appreciate the ignorance of the pupil.

The conduct of classes by graduate nurses has even greater disadvantages. In the first place, it is extremely difficult to teach anything to anybody merely by thumb-rule or by memory. There must be a reason—why is this done so? The graduate nurse, as a rule, does not know why. She herself has been a creature of discipline. As a rule, she knows mathematically and in detail the practice of any doctor whom she is serving in any given set of cases and under nearly all circumstances. She knows, for instance, what a certain doctor's treatment of postpartum cases is, what aperient is given, and what sort of binders are used for mother and child, and how they are adjusted; but rarely does she know the reason for these things. She can only state facts, and not inculcate lessons by appeals to reason, so that she is not the best possible teacher for the pupil who is expected to remember what she is taught.

Of course this criticism cannot extend to the few specially trained women of to-day who have so far progressed as to be postgraduates of one or another of the few universities that have departments for fitting young women to teach in training-schools. Columbia University is perhaps the best example of such a school, and some very highly trained women are leaving there who will, perhaps after all, solve the question of who shall teach the nurses in the training-school in the theoretical, as well as the practical, side of their duties. Only one word more just here: Is it not possible for these specially trained women to gradually overrate the capability of their pupils, and attempt to give them something that they are not qualified to take—not only that, but there seems to be a great danger that these specially trained women will be tempted to exaggerate the theoretical side of the training at the expense of the practical side.

The house physicians are the poorest of all teachers for the nurses. In the first place, these young men have themselves come into their junior internship with barely more practical knowledge than the nurses themselves possess. Oftentimes there are nurses who can teach them certain details of the hospital work, and again they have no personal experience upon which to call for the reasons for doing things in a certain way. They must state facts merely, oftentimes quoting from the text-books. These young men too have just come from the medical schools. Their experience of life has not been great. They assume that because these

young women are bright, quick witted, and quite their own matches in conversation, that they are also their equals in book learning, which is not true. Because they learned in their earlier years of school life the physiologic action of drugs upon certain of the tissues of the body, they assume at the outset of a lesson on materia medica that the nurse also must have learned these things, hence, they start out upon premises that are artificial to the nurse, and they entangle her in a maze of technicalities and scientific phrases and text-book learning that she does not appreciate, therefore she will not learn. There is another phase of this question of the teaching of nurses by the house staff—members of the house staff are young men; pupils in the training-school are young women. In most institutions there is more or less of an effort to keep these young people apart, in the interest of discipline and good government and efficient work. In some instances the effort goes so far that the young people of both sexes are dismissed if they are discovered together, excepting in the actual performance of duty. So that it would seem almost tempting fate to permit these young men to lecture to the nurses, to quiz them, to conduct examinations, written and oral, and to exercise that certain amount of teacher-and-pupil intimacy necessary in class work, and then expect them to hew to the line so closely that their association shall end at that point.

Since we have ruled out all these factors in the teaching of a pupil in the training-school, we would seem to be left almost without a teacher at all. But there is another class, namely, the younger members of the visiting staff of the hospital. These young men have nearly always served their internships in the institution. They have now gone into the practice of their profession; they know the technic of the institution in all its departments; they know the methods and procedure of the older medical members of the staff. They have had a vast amount of experience in the practice of medicine as the pupil nurse will see it. These young men have been in such close touch with the nurses during the past few years that they know the limitations of these young women, and they will not expect unreasonable knowledge on their part. They know pretty well the hard places in the road the young women will have to travel, and they will be able to help them over gracefully and intelligently. They are not on so intimate footing with the nurses as the members of the house staff, and they are not so superior to the nurses as the older members of the visiting staff, and hence there is a certain amount of comraderie between these two elements without familiarity. So that it is to these adjunct young workers in the medical staff of the hospital that we will be able to look for the theoretic training of the nurses in the institution.

Experience has taught that it is not well for one teacher to teach more than one subject to a single class. One who is teaching one subject to-day and another to-morrow will find it almost impossible not to allow one to intrench upon the other to an extent that will hopelessly entangle the minds of the pupils. Even one who teaches physiology and materia medica will find that his toxicology and his physiologic action of drugs will so enmesh his class in obscurities and ambiguity that the members will not get a very clear idea of the intention of the teacher.

It would seem, then, that the ideal way to have the pupils taught the theory of nursing is by the younger members of the visiting staff of the institution, one teacher for each subject.

Necessity for Rigid Technic.—We have agreed elsewhere that the pupil nurse is largely a creature of habit and discipline. If this is true, and it might be added that it is true, not only in the training-school for nurses, but with young people in every walk of life, then we must arrange the work for these young people within such narrow confines that they will learn thoroughly the things it is intended they

should know. We find in the wards of the hospital that the older medical men are a good deal less prone to observe technicalities and the necessities of technic than the younger men, for the reason, perhaps, that the older men are falling back largely upon their experience, not only professional, but in the affairs of life generally, and as the volume of their experience grows and as their view-point broadens the fine points become less distinct, and the details blur a little; the next stage after this, in the work of the veteran member of the medical staff, is carelessness, a tendency to ignore technic in all its branches, and it is at this stage that the work of the veteran physician ceases to be clearly defined, snappy, and up to date; it is the beginning of the end. With the younger men discipline is everything, technic is paramount, details are absolute necessities, and their work will, therefore, show in their results. So it is with the pupils in the training-school. Where the discipline is lax, and where the technic is diffuse and not finely demarked, there will presently be no technic at all. Once convince these young women that it makes very little difference whether they do a piece of technical work one way or another, and they will soon cease to do it at all, and will regard it as quite an insignificant matter. We have called attention to this state of things as one of the disadvantages in maintaining the open-door policy in the hospital, and of allowing the medical profession at large the freedom and courtesies of the institution. When the nurse is attending to the patient of one man, and is taught to do certain things in a certain way, and is then compelled to reverse her technic when she goes upon another case for some other physician, she will become slovenly and indifferent, and is very apt to make up her own mind that technic is not a matter of very great importance.

So that in every well-regulated and systematically operated institution there is a rigid technic, and a narrow, emphatic discipline in the training-school. Everything is done just so, and no changes may be permitted under any circumstances. Sometimes this discipline reaches an embarrassing point; it is one of the prime necessities of hospital nursing that the nurse shall obey the doctor's orders. If the doctor gives an order that is wholly contrary to the teaching of the pupil, she is sometimes taught to refuse obedience, and the head nurses or superintendent of the training-school must be appealed to before the doctor can have his orders obeyed. This condition of things is not always an unmitigated evil, because oftentimes the stranger in the institution who has an occasional patient does not do things according to modern methods, and it is frequently just as well that a point be made of some one order that he may want to give, in order that he may understand at once that he is expected to do technically correct practice, and he will be more careful if he is called to time by even a pupil nurse or a probationer, who may have to tell him she doesn't know how to do it his way and that she has been taught differently. It must not be understood that the doctor's orders are not to be carried out eventually, but that no pupil nurse is allowed to carry out an order of her own volition that is contrary to what she has been taught without consent of her superiors in the training-school. It requires a good deal of self-assertiveness on the part of the pupil nurse to disobey the order of a commanding figure of a medical man, and she will have to be supported when she does so. When such an appeal is made by the pupil nurse to her superiors concerning an order to perform some service that she has been taught is improper and untechnical, the heads of the training-school should always take up the matter with the doctor, not for the purpose of arguing him out of his own opinion as to what should be done with his case, but merely to compel him to place his order in specific form, and, after due consideration, and if the head of the training-school regards the order as improper

and one that should not be carried out, then she in turn should take up the question of the conduct of the physician with those in still higher authority, whether it be the chief of the medical staff in that particular department or the superintendent of the institution who has to do with the medical men.

The point that should be emphasized definitely is that there should be a distinct and rigid technic in all parts of the institution, and that this technic should not be lightly set aside, and that, when it is set aside on the peremptory order of some physician in attendance on a patient, it is at the end of a good deal of controversy and argument, in order that the whole question shall have due weight as a departure from the routine practice of the institution.

Length of the Course.—We are now about to enter upon a discussion of the time-worn controversy as to the relative merits between the two- and three-year courses of training for pupil nurses. This quarrel is a classic one, and, without any question, attempts to settle it have been commenced at the wrong point, and it will be settled just as soon as training-school authorities and hospital administrators agree on what is expected of a nurse, and not before that time. If it is proposed to make a half-educated medical attendant out of the pupil nurse, and to teach her something of every branch of medical science, then the quarrel will be shifted presently with a two-year proposition left as a dead issue, and a four- or five-year course looming in the distance. If, on the other hand, we are to finally agree that the duty of a trained nurse shall be to carry out in an intelligent, dextrous, and skilful manner the orders of the doctor who is responsible for the patient's welfare, and that her duty will cease there, without any pretense of medical technic, then perhaps the two-year advocates will have a "standing in court," so to speak, and not until then.

Is there not a happy medium between the long course, that has for its purpose deep invasion of the realms of medical science by the pupil nurse, and that far shorter course that merely fits her for duties a little above that of the menial? And can we not all agree that in three years a young woman of fair education and good sense should be able to master the essentials of a scientific care of the sick, learn the lessons of responsibility in her calling, and a self-discipline that will fit her for the serious work of her profession while she devotes herself to a full day's work and a full night's rest, with such added hours and days of recreation as all the schools afford?

This question could be met and settled quicker and far more satisfactorily to all concerned, but for the existence of a large number of small training-schools in the country attached to private hospitals operated for profit, and for no other purpose. The administrators of these hospitals care very little about the training of a nurse, so far as her future efficiency and her own interests are concerned; their great anxiety is to obtain the services of as many pupils as they can get without remuneration; and if they were able to attract a sufficient number of pupils for a three-year course, we would hear no more about the two-year course. The difficulty is that if the pupils are compelled to serve three years, no matter where they matriculate, they will inevitably go to the larger hospitals, where the training is broader and usually better, and so the small private hospitals will be compelled to employ graduate nurses to do their work and to pay for the service.

Hours of Duty.—We have now another classic quarrel on our hands—that is, the two-shift versus the three-shift service in the hospital.

Let us first see what a two-shift nurse has to do: she comes to her breakfast at 7 o'clock. She is on duty at 7.30, and works until 12.30, when she goes to dinner. She is back on duty again at 1.15, and works until 3 o'clock; then she has two hours off, then a half-hour of work; from 5.30 to 6.15 she has supper, and from 6.15 until

7.30 she works. At 8 o'clock, three times a week, she has classes. Adding up all of this time, the day nurse in the two-shift service actually works eight and a half hours plus one hour for class work three times a week for, say, eight months in the year.

There is during these hours of labor a constant change of occupation, a constant shifting from one piece of work to another. It is not a hard mental work. There are a good many recreation hours, and the nurse, if she takes care of herself, or is compelled to do so, has a good deal of fresh air, and there is no good reason why she should not remain healthy and strong and active mentally and physically.

It is not a question whether the three-shift service would be pleasanter and less arduous for the pupil nurse; the main question is, is the two-shift too arduous, too confining for the pupils to stand? The contention by those who are active advocates of the three-shift service is that the pupils do not get time enough to study their lessons, and that they are too tired at the end of the day to do so even if there is time. Perhaps this is true. Would not this point be met, however, if we agreed to teach the nurses by methods that would necessitate less study on their part, and that would give them a greater insight into their subjects during the recitation or lecture hours; in other words, apply the object-lesson method? This, of course, takes us back to the question of the ability of lecturers to teach as well as to lecture. There are many men and women who can conduct a class in any given subject, so that the pupils will have mastered the subject at the end of the hour, whereas another lecturer will merely emphasize the necessity for the pupils to go home and get their books out and study the lesson. In the public schools of this country the object-lesson method has been substituted for every other plan in the teaching of small children and of young pupils generally. They are taught by reason and precept, example and illustration, and not by talk.

However, the strongest argument against the three-shift service has to do with the patient in the hospital. There are two shifts in sickness—a day and a night shift. The doctor recognizes these two shifts in the condition of his patient, and, while he would far rather the same nurse remained on the case throughout the twenty-four hours, he will always regard with anxiety and misgiving three distinct changes in the nursing service, and the consequent loss of that peculiarly personal relationship that must exist between patient and nurse if the former is to have the greatest possible amount of watchfulness and care.

Home Life of Pupil Nurses.—It goes without saying that the home life of pupil nurses in the training-school ought to be made as happy and pleasant as possible, just as the home life of every young woman ought to be made happy and pleasant. For many of these young women the three years of their training are about all the girlhood they have. At home perhaps the social and financial status of the family has compelled them to work hard, to live within narrow limits, perhaps to help younger children, and some of them have worked for their living long before they came into the training-school. If their domestic lives in the school are well regulated they ought to have good times. Their hours of duty ought to be well mixed with hours of recreation. They ought not only to be allowed to romp—they ought to be encouraged to do so. The nurses' home that has a gymnasium and a swimming pool will be almost ideal. A piano in the parlor, and the greatest latitude in its use, will help to while away many a lonesome hour. They ought to have parties. In some of the large institutions the training-school pupils are given a party every month. In a few of them a party every two weeks is the rule—not expensive, formal affairs, but an informal meeting of young people, girls and boys, during which there is dancing, a light lunch, perhaps sandwiches and

coffee, and a lot of girlish giggling and talk. These parties wipe away almost the whole memory of sick-room service, the long vigils of the night, and the foot-sore trampings of the day. Who ever heard of a pupil nurse whose feet did not hurt all day long, and who ever heard of a pupil nurse whose sore feet interfered with her dancing at night?

It goes without saying that every pupil nurse should have a room of her own, and if she can have a private bath so much the better.

Training-schools are not exempt from those epidemics of morbidity that so often invade convents and young women's academies and girls' schools of every description. One morbid pupil, with erotic tendencies, can sometimes pollute a whole training-school.

Not only should the health of the girls individually be looked after carefully by the supervisor of the nurses' home, but the health of the home, as a whole, should be regulated by proper hygienic and sanitary equipment of every sort for the occupants. It is not enough that the plumbing and ventilation shall be right, and that the pupils shall be compelled to use fresh air in large quantities, but the supervisor should act in the capacity of a mother to these young women, so many of whom, although in the second and third year of their training, have not the slightest idea of how to take care of themselves. They should be taught to keep their bowels open, and the supervisor should see that they do so. They should be taught to protect themselves before and during their menstrual periods, and they should be supplied with proper sanitary appliances for use at that time.

A good many of the pupils in the training-schools come from long distances, and have no social acquaintances at distances near enough for daily visits and recreation and change of air and scene, and hence, during their hours off each day, they sleep or read some trashy book, and on their "half-day" they do the same, and when their "whole day" comes around once a month they have nothing to do, no place to go, no incentive to change their environment, and hence they remain in the home, fail to take proper exercise, keep constantly to the old mental channels of thought, and vegetate mentally and physically. This sort of thing is not natural to a young girl, and if she is encouraged to get away froms the home to go on little excursions, to go to inexpensive places of amusement, or to the parks, or for long walks, she will soon acquire a habit of doing so, and will be a far better pupil and a healthier girl.

In the section on Interns we have considered the relationship of the young men to the pupil nurses, and so need not again go into the subject.

Undergraduate Specials.—In almost every hospital there is a scarcity of nurses, and this will happen oftener in small hospitals than in large, for the reason that it is more difficult for small hospitals to secure an acceptable class of applicants, partly because of the limitations in the training that the young women will get in the smaller institution, and partly because the work of nursing in small institutions too often partakes of the "maid-of-all-work" character, and young women of education and refinement do not like this sort of service, hence, they will seek large hospitals that have serving maids and maids of all work, and cleaners of various sorts, male and female, and male orderlies, so that the nurse can do actual nursing, rather than a multiplicity of things that teach her nothing and that are mere drudgery.

Some of the heads of the best training-schools in the country do not take kindly to the idea of placing pupil nurses in positions as undergraduate specials on cases in the institution. They say, and with a good deal of justification, that the nurse learns very little under such circumstances, that if there were very much

to do of a technical character she would not be detailed for the purpose because she would not be qualified, hence she would learn very little there and would be losing a good deal of her training in directions that would be of far greater value; that if there is very much to do of competent nursing in these special private-room cases there could not be a sufficient amount of surveillance of pupil nurses' work to make that work of any value to her in her training.

They say, moreover, that the pupil is giving more than an adequate return for the time and expense of her training in the amount of work she does on the wards and in the routine work of the institution; therefore, it is unfair to ask her to submit to assignment to duties that are wholly in the interest of the hospital and that have to do with the institution's financial betterment rather than the pupil's training.

There is another side of this question, however; nearly all institutions have a very serious financial problem to face constantly, and they must make every item and every factor count toward meeting their financial necessities—hospitals are not mercantile institutions, and in most hospitals it is considered a most desirable condition of things to have enough pupil nurses to use some of them as special nurses on private cases. Generally the hospital gets $15 a week, more or less, for the services of these undergraduates, and, while perhaps they may not be quite so efficient as the graduate nurse, who will oftentimes have to be brought into the institution to nurse special cases, they will be certainly more amenable to the discipline of the institution, and, because they will be compelled to work more strictly under the direction of the head nurses of the department, it is a very serious question whether their service will not be, after all, more efficient, so far as the patient and the physician are concerned. As a rule, undergraduate specials are chosen for each individual case, and there need not be a rule in the institution which provides that undergraduate specials shall be of the senior class. Oftentimes there is almost nothing to do for these patients, except to be in the room. Sometimes they will require the simplest sort of service, a service that a probationer can do quite as well as a more advanced pupil, and certainly the probationer, being of less use elsewhere, can be better spared for such cases.

It is the easiest thing in the world to persuade a private-room patient in a hospital that he or she has just cause for complaint about something in the service or in the food, and it is a well-known fact in hospitals where graduate specials are employed that many of these young women are in the habit oftentimes of laying the burden of their own shortcomings and laziness on the institution itself. If the room is not cleaned properly and promptly the graduate nurse is the first one to complain of the laxity of the service in the hospital, and when this complaint is uttered in the presence of her patient it has a demoralizing effect on the latter. Or, if there has been some inattention on the part of the nurse or a failure to carry out some order that the patient herself has heard the doctor give, the graduate nurse will oftentimes excuse herself on the ground that the hospital refused to supply her with the necessary material to carry out the order. And so it may be quite safely said that a very large proportion of the complaints uttered by patients against the service of a well-regulated institution are either instigated by the graduate nurse or could have been prevented by her. On the other hand, the undergraduate, being herself a part of the institution and its administration, and being subject to the discipline of the training-school and her superiors, is much more likely, first, to please her patient by every possible exertion because of her discipline, and second, to minimize any little shortcoming or laxity in the service rather than exaggerate it; so that the hospital administrators generally try, as far

as possible, to furnish undergraduate specials to private patients rather than call graduates from private duty on the outside.

In most of the large institutions graduate special nurses feel themselves independent of the training-school discipline, refuse to be bound by it, oftentimes resent any interference, and hold themselves responsible to the physician alone. It is to be feared that sometimes this attitude of the graduate nurse has its birth in, and is fostered by, the disinclination to be responsible for her acts to the doctor on the case. This whole attitude of the graduate nurse is to be greatly deplored, and seems to be hastening the day when the well-regulated hospital will refuse to employ outside nurses, or to allow them the courtesies of the institution in their professional capacity, because of their growing arrogance in almost every city and every institution.

Considering the undergraduate or pupil in the capacity of a special nurse, however, we are confronted by a responsibility toward the pupil that it seems we do not weigh quite heavily enough. The good soldier obeys orders, and the well-disciplined pupil nurse goes where she is sent, and performs her duty there to the best of her ability, and remains, like a picket on duty, until relieved. Sometimes the case is an extremely arduous one, that requires the nurse to lose an immense amount of sleep, and to be on her feet and rustling every minute of the time. The good nurse does not complain; consequently, unless the heads of the training-school watch very carefully the service of the undergraduate special, they will find their pupil is being overworked, and doing day and night duty to an extent that will undermine her health. Instances have been known where a pupil nurse was put on a case and kept there on twenty-four-hour shifts until she was utterly broken down and sent off sick. Immediately thereupon two graduate specials have been required to do the same work the unpaid, overworked pupil nurse had done until she was incapacitated; it ought to be borne in mind, therefore, that very great care must be taken in the selection of patients in whose cases an undergraduate special may be employed, to see that the work is either arranged in double shift and two pupil nurses employed, or to see that ample arrangements for relief are made.

The Graduate Special.—We have almost covered the question of the employment of graduate nurses within the institution, but, since we are now upon the subject of nursing, and, therefore, on the subject of the training-school, it would seem in place to discuss at least briefly the question of the duties of graduate nurses. We have argued somewhat against the principle of the employment of graduate nurses in the hospital, and the reasons have been given. Sometimes, however, it will become necessary, either because of scarcity of nurses in the training-school or because of insistence on the part of patients or their friends or the physician, to bring in a graduate nurse. In most institutions where this is done, and it is done almost everywhere, the graduate nurse comes in and takes charge of her patient with a chip on her shoulder, so to speak, resenting interference at every point, and reserving the right to ride over rough shod the rules of the institution appertaining to everybody. If the institution discipline and administrative functions of the hospital alone were disturbed by this attitude it might not be quite unbearable, but these are the least of the difficulties. Most graduate nurses forget a good deal of their training after they have left the hospital a short time, and no longer are mistresses of the technic of the institution and its ways of doing things; therefore they become unfamiliar with apparatus and instruments, and they are disposed to call for new things, and they even attempt to disturb the technic of the institution and to revolutionize wherever they may; and sometimes, where they are not per-

mitted to do so, they will succeed in arraying the patient, the patient's friends, and even the physician against the methods and procedure of the institution, and we next hear the complaint that there is too much red tape employed, and that, therefore, the patient suffers for want of proper and prompt attention. Without doubt, most of these graduate nurses are loyal to the institution because they are graduates of it and because their friends work there, and because the institution helps them to get private cases, so that we may safely assume that it is merely want of tact that makes them unruly and apparently disloyal.

There is a cure for this, and that is to have a code of rules for graduate nurses on duty in the institution that must be inviolably lived up to and infractions punished by dismissal; and, since hospital berths are most attractive to most graduate nurses, if they are given distinctly to understand, and if there have been a few illustrations to emphasize the fact that they will be dismissed from the institution if they do not obey its rules, there will presently come a pretty well understood relation between the institution and the graduate nurses.

Sometimes the heads of the training-school, who are responsible for the execution of these rules, will excuse want of obedience by the statement that they cannot afford to drive away the graduate nurses who condescend to perform service there. A little reflection, however, and a little inquiry into the attractiveness of institution service from the standpoint of the graduate nurses will reassure us on this point, and in some places, where a strong stand has been made, and where these young women have been compelled to obey rules, even they themselves presently admit the advantage of the rules and the betterment of the service because of them. Perhaps first among these rules is a provision that the graduate nurse shall work under the general supervision of the head nurse of the department. This is the most difficult of all rules to enforce, and it is the one above all others that needs enforcing, primarily for the good of the patient and in the interest of the execution of proper orders.

It may be noted that very few institutions work under definite printed rules for graduate nurses, and it may not be out of place, therefore, if we subjoin some that are in use in at least a few of the institutions of this country:

Rules for Graduate Nurses

Immediately upon entering the hospital, the graduate nurse who has been called for a case will report to the superintendent of the training-school for orders concerning the patient.

Graduate nurses will wear their full uniforms when on duty in the hospital.

Graduate nurses will wear rubber heels in the hospital, and will not be permitted to go on duty without them.

Graduate nurses, when leaving the room of the patient at night, will be dressed sufficiently to appear in public.

The graduate nurse will be required to carry meals from the serving room to her patient, and to return the used tray promptly after the meal is over. She will be required to wash whatever dishes or utensils she has occasion to use, excepting for the regular meals, and to return them to their proper places on the shelves.

Private rooms are swept and dusted once daily, and rugs are cleaned as often as necessary; the nurse will be expected to otherwise keep her patient's room in a clean and orderly condition.

It is an important part of the duty of the graduate nurse to make her patient comfortable mentally as well as physically, and to see that patient, relatives, and friends are pleased with the institution and its service.

The graduate nurse is understood to have entered the service of nursing in the hospital with a full knowledge of its rules in all departments, and of the technic of all nursing procedure, and to have accepted the responsibility of conforming to them. She will nurse her patient according to the methods of the institution in all details.

The graduate nurse will take orders for her patient from the medical attendant in the case or from the intern on the service; if, for any reason, the orders cannot be carried out precisely as given, she will immediately communicate with the intern, or, failing to reach him, with the attending physician, to have the orders changed. If she cannot reach one of the responsible

physicians she will lay the difficulty before the nurse in charge of the floor or ward or the superintendent, and thus place responsibility where it belongs, whether on the physicians or on the nursing representatives of the hospital.

Graduate nurses on duty in the hospital are expressly forbidden to eat in their patients' rooms, or to order any food whatever excepting for their patients' own use.

Graduate nurses will not be permitted to visit in any part of the hospital excepting where their duty lies, excepting with the explicit consent of the superintendent of the training-school in each instance.

Graduate nurses will be expected to report all breakages and damage to hospital property immediately on their occurrence, and to pay for same unless payment is expressly waived by the superintendent of the hospital in each case. Failure or refusal to pay for same on demand will subject the offender to immediate dismissal from the institution, and she will not again be permitted to nurse in the hospital until the amount has been paid.

The hospital declines to collect fees for graduate nurses, and will under no condition assume any responsibility for same. The institution business office will at any time be pleased to give the special nurse any information in its possession concerning the financial responsibility of her patient, but declines to be held responsible for the correctness of said information.

The hospital, as an accommodation, provides board for graduate special nurses on duty there, charging the actual cost of same against her patient, but the institution will, under no conditions, undertake to furnish special diet for nurses on duty.

Repeated or flagrant violation of these rules will subject the offender to dismissal and to refusal of further employment in the institution.

Graduate Nurses in Private Practice.—We enter upon very briefly here the contemplation of a situation which may be characterized as very little short of disgraceful. We are all of us busy training pupil nurses to be efficient, intelligent, obedient caretakers of the sick, with the intention that as soon as they are fitted for this work they shall be clothed with proper authority as certified in their diplomas. We have a right to assume when a nurse leaves the institution with her diploma in her hand that she is going to make herself useful to sick people, and we uphold her in certain demands that, on the whole, bespeak for her a position of dignity and importance, one well up in the social scale, and one in which she will not be burdened with overwork. In return, we ask of her the performance of certain duties in an acceptable manner, and those duties have to do with the sick person, with the family and friends of the sick, with the physician who is responsible for the care of the sick, and with the public at large. The term disgraceful, as applied to the situation in this country, is justified by the unquestioned fact that graduate nurses, as a class, are not living up to the expectations either of the public, the physician, the patient, or the schools that sent them out.

Let us see briefly wherein lies the failure: in the first place, the home to which the graduate nurse is called is in a turmoil; some one is ill, the family is anxious and in trouble, things generally are at sixes and sevens, the servants have no mistress; the housekeeping duties are neglected, the meals probably irregular; the servants are asked to serve one or two members of the family at a time, and, therefore, the meals are strung out almost through the day. The servants, being rather an ignorant and consequently narrow-minded lot, become impatient and dissatisfied, and they talk about leaving, even if they do not go so far as to actually quit the service of a family that has already trouble enough. Now, the graduate nurse comes on the scene. Would it not seem that a part of her duty, after she gives her immediate attention to the sick person, is to help make things comfortable and pleasant in the home itself, to make as little trouble as possible, to go about her duties without friction with the servants, to make few demands of a personal nature, and to content herself with what is in sight?

Will any of us dare to say that this is the common attitude of the graduate nurse? It is not the experience of most of us. If we ask ten people who have had graduate nurses in their families during the past year, nine of them will agree that the nurse required more waiting upon and more personal service than the sick person; that

she made demands that were oftentimes practically impossible to gratify; that her first thought was for herself and her personal comfort, for her meals, and for her sleeping accommodations, for her laundry, and so on, down a long list of outrageous demands.

Fortunately, there is another side to this picture, and all of us have personal knowledge of a number of graduate nurses and their methods, who bring to their duties an unselfish devotion, a tact and thoughtfulness worthy a better reception. There are some women and men, too, who employ graduate nurses, and who at once set them in a class with the cook and the laundress; who exact of them the most menial service of a personal nature; who work them day and night, not only in the care of the sick for whom they were employed, but in a personal service for well members of the family.

To illustrate what a graduate nurse in a house of trouble should be: she steps soft-footed into the house of sickness, she takes with her a cheery smile, a modulated voice, and an animated demeanor. She goes about the house getting what she needs for her patient. If she cannot find precisely what is wanted, she will oftentimes make something else do. She will make friends with the servants, and, after an hour, sometimes will have them on her staff working disinterestedly with her toward a common end. Oftentimes, and by easy stages, she will unobtrusively take over the duties of the housekeeping, sometimes even to the extent of ordering the meals. She will provide little comforts and pleasant surprises for the grief-stricken mother, perhaps, and so by her good offices render her presence in the home a distinct blessing, rather than tolerated as a necessary evil.

Without any question, this disagreeable attitude of the average graduate nurse in private practice, when it exists, is the fault of bad training. In the curriculum of nearly every training-school there may be found a course of lectures on the "ethics of nursing," and it will be found of intense interest to those of us who are actively interested in nursing problems, if we were to listen to one of these lectures or read one of them that attained the dignity of publication. When we know what these lectures contemplate, as a rule, we will have very little difficulty in judging the cause of poor nursing, poor judgment, and want of tact in the modern graduate nurse.

There is a cure for this, and that cure must be administered in the training-school, and it must take the form of definite teaching of the domestic virtues, of tact in the attitude of the nurse toward her patient and the people who surround the patient. A lecture on ethics will not do it; it must be a constant drilling; it must be a drilling on the wards of the institution, in the private rooms of patients there, in the conduct of the pupil nurse toward her comrades and co-workers in the hospital.

The Nursing Profession and the Public.—The earnest, thinking friends of the nursing profession look with a good deal of apprehension upon the tendency of present-day methods in the profession that seemingly have for their object the establishment of principles on the lines of labor unions.

In all other professions—that is, medicine, law, engineering, and art—it has long become an established principle that there can be no fixed prices for professional services independent of the conditions in each case; and those of us who are anxious to see the profession of nursing established on a high plane feel the same way about that profession. Just how far we may go in this direction it is difficult to say, but those of us who share the fear that the nursing profession may be brought down rather than lifted up by the inculcation of union labor principles, are looking toward the nursing commissions of the several states, that have been recently established under new laws, for a solution of this much discussed question.

Nearly every state in the Union now has a nursing law, and they are pretty uniform, taken altogether. They differ, of course, in details, but they follow the same general principles. In some states the commission, usually appointed by the governor, is made up wholly of nurses. In other states, such, for instance, as Pennsylvania, the nursing commission is made up of physicians and nurses. And, yet again, in a few states there is a small admixture of influence outside both these professions by the appointment of some public-spirited citizen, who has taken a particular interest in nursing as a profession. In some of the states these commissions have risen to a high plane, and have fine aspirations for the profession. In other states there is a definite trend toward the principles of union labor.

Without any question, time will smooth out many of the rough places, and it is to be hoped that wise counsel in the leadership of the profession of nursing will set that profession beyond the sordid things that have their whole expression in a fixed rate of pay per day for the trained nurse, irrespective of her qualifications or previous education and her power for initiative. The state nursing commissions have hardly gone far enough with their work as yet to be fairly judged as to what the future will bring, and some of them that seem to have been going in a dangerous direction will undoubtedly see their mistakes and correct them.

For instance, in some of the states the nursing commissions have prescribed a curriculum for the training-schools that goes very far beyond the capacity of women who are obtainable to enter these training schools. Of course this practice must eventuate in badly trained nurses, just as any one in any calling will be badly trained who is asked to prosecute his or her training far beyond the mental capacity of the individual. This, too, will be smoothed out in time. And even the qualifications for entrance to the training-schools will be set upon a different plane, or the curriculum established by the state commissions will be modified to meet the practical necessities of the case.

In this modern day the trained nurse is a necessity, not a luxury. Fortunately, the people are finding it desirable to go to the hospitals when they require technical care, and this will come to be the case more and more every year, until presently it will be considered a matter of course that the man, woman, or child who is sick, from whatever cause or with whatever ailment, shall go to the hospital, but until that comes the sick must be nursed at home under certain conditions, and there must be nurses to take care of them. A goodly part of this work is done now by visiting nurses employed by associations of various sorts, and the visiting nurse is another expression directly from the public that the average individual at home cannot afford to pay the price of a trained nurse, and, therefore, the community is being asked to pay for the trained nurse.

A very large percentage of the cases of illness that remain at home to be cared for need very little or no technical attention, and in a great majority of these cases the people cannot afford to pay a trained nurse. The question is, What is to be done about it? Are they to have trained attention withheld from them because they cannot afford to pay the schedule price? This is quite satisfactorily settled in the medical profession, because it is uniformly recognized that physicians must base their professional charges upon the ability of the patient to pay and not upon the value of the service, without any other condition than the doctor's ordinary charges. We all know very well that the ablest men in the medical profession, both those in general practice and those restricting themselves to the special branches of medicine, do an immense amount of work at vastly reduced prices, in addition, of course, to what they do entirely free. This principle of "tempering the wind to the shorn lamb" is so thoroughly understood in the medical profession that we

need not dwell on it, and it is understood quite as well, too, that the doctor has a right to charge more than his ordinary fee to the patient who can abundantly afford more, and the patients themselves recognize this condition of affairs, and, as a rule, acquiesce in it.

Is it not possible to place the nursing profession on some such plane as this? Of course, there is the difference that the nurse must give her whole time to one patient, and that she cannot be earning money elsewhere while she is on that case. Then, shall we permit her to charge more on the next case where the people can afford to pay more, or shall we detail, to take care of the patient, the nurse of mediocre attainments, one, perhaps, not at all popular with the doctors in her sphere, but who is recognized as a conscientious, painstaking nurse?

We know there is as much difference between the ability of nurses as between doctors or lawyers, and it is never expected that the doctor of mediocre attainments and limited education shall earn as much money or receive as high honors as the man of extraordinary ability; and does not all this bring us back again to the question, Whether we shall not have grades of trained nurses whose diplomas from their schools and whose licenses from their states shall prescribe precisely the character of work they may or may not do?

THE CURRICULUM

Schedule for First or Junior Year

First year pupils are divided into divisions according to the number in the class, and without reference to the probationary period, each division taking the same work at different hours and under the same teachers; it would seem expedient to put the brighter or better educated girls together, and those less favored together.

Dietetics (this work is given in the diet kitchen in actual work of cooking for patients, and in lectures by the dietitian):

1. Foods—marketing and care of foods.
2. Classification of foods chemically.
3. Character of food constituents, proteins, fats, carbohydrates, etc.

4–6. Physiology of the digestion—describe the alimentary canal, juices along its course, and functions of each, beginning with the mouth.

7, 8. Chemic and physiologic values of specific food articles.

9, 10. Metabolism—what becomes of the food and how it is distributed to the tissues as nutriment.

11, 12. Waste—what is wasted and what becomes of it.

Note.—These lectures may be contracted into fewer or more lectures, according to the time at disposal and the abilities of the classes.

Household Economics:

1–3. Relative value and uses of household materials and their care.

4, 5. Furnishing a house; furnishing a room; furnishing a sick room.

6. Ventilation in the home, in the hospital, in the sick room.

7. Plumbing and drainage—the care of sinks, basins, toilets.

8. The disposal and destruction of infectious excreta.

9, 10. Linens—purchase and test of cloths; care of linen and cotton goods. Making up hospital pieces.

11, 12. The laundry—how to wash and clean wool and cotton goods, blankets, flannels, curtain cloth, and the rougher wash goods.

Note.—Part of this period should be spent in the linen and supply rooms at mending, sorting, distributing, and making up supplies.

Surgical and Medical Supplies:

1–5. Use and care of material—bedside utensils, bed furnishings, rubber goods, enameled ware, etc. Cleaning and sterilization.

6–10. Surgical dressings and material—bandages.

Surgery: Surgical dressings.

1–5. Surgical dressings.

6–10. Bandaging.

Anatomy and Physiology (12 lectures with manikin or plates, on the chief organs of the body, with physiology of each):

1. Brain and spinal cord and nervous system.
2. Thorax and diaphragm.
3. Heart.
4. Lungs.
5. Abdomen and peritoneum.
6. Stomach.
7. Intestines, small and large.
8. Liver.
9. Spleen and pancreas.
10. Kidneys and adnexa.
11, 12. Bladder and lower urinary tract—genitals.

Materia Medica (10 lectures and demonstrations—the principle families of medicine, the commoner forms of administration, physical and physiologic character of each, and dosage).

NOTE.—Details of this subject must be left to the teacher, unless some primary text-book is followed.

Pathology and Bacteriology (15 lectures in the laboratory, illustrating and demonstrating the pathogenic and non-pathogenic micro-organisms; the fundamentals of asepsis and antisepsis).

NOTE.—All the groups will have demonstrations in bedside nursing, the use and handling of bed-pans, urinals, head and back rests, lifting and moving patients; use and care of rubber goods, water-bags, ice-bags, rubber tubes, catheters, stomach-tubes, etc., the giving of enemas, high and low, irrigations, care and use of percolators, dressing cars, etc.

SECOND YEAR

Dietetics (practical repetition of first year's work, with more detail in making up of special diets for certain classes of patients, diabetics, etc. This work will be in the diet kitchen and in lectures, the number of which will depend on the time allowance. Caloric and chemic calculations of foods will be taught at this time).

Medicine:

1. The keeping of records, taking temperatures, pulse, respiration, and why.
2, 3. Importance of little things in records: vomiting, nausea, chills, body movements, like tossing head, etc., rolling eyes, gritting teeth, lapses into delirium, spasms, general or local; character of bowel movements and peculiarities of same with significance.
4–6. The eruptive fevers, their differential diagnosis and fundamentals in treatment.
7, 8. The acute fevers, pneumonia, typhoid—principals underlying their care.
9, 10. Arteriosclerosis—chronic interstitial nephritis and complications—Bright's disease.
11. Diseases of the digestive organs, gastric disorders, diarrhea, dysentery, constipation.
12. Diseases of other abdominal organs—liver, spleen, kidneys, pancreas, the enteroptoses.
13, 14. Tuberculosis—pulmonary—elsewhere.

Anatomy:

1. The bony frame—its physical properties and uses—its physiologic properties.
2. The bones of the skeleton—their divisions—the long bones—the flat bones—the round bones.
3. The bony cavities—what each contains—Nature's protective devices.
4. The brain and cord—functions—major divisions.
5. Throat—pharynx—larynx.
6, 7. Thorax—heart, lungs, pleura, diaphragm—relations and gross functions.
8, 9. The abdomen—stomach and intestines; liver, spleen, kidneys and ureters, pancreas, ovaries—their relations and location.
10, 11. The pelvis—bladder, uterus, rectum, and genitals.
12. The muscles of the body—flexors, extensors, physical properties—direction of their action in relation to origin and insertion.

Physiology:

1. The circulation of the blood and its functions.
2. The functions of the brain and cord.
3. The functions of the heart.
4. The functions of the lungs.
5. The functions of the stomach and intestines.
6. The functions of the liver, spleen, pancreas, kidneys, and skin.
7. The generative apparatus—male.
8. The generative apparatus—female.
9. The sympathetic and general nervous system.
10. Organs of special sense—eye.
11. The ear.
12. The nose.

Surgery:

1. Fractures and dislocations—treatment.
2. Wounds of soft tissue: incisions; contusions, lacerations, burns and frost bites; treatment; processes of repair.

3–5. The classical surgical operations.

6. Orthopedic surgery: aims and fundamentals.
7. Corrective or plastic surgery.

8–10. Surgical preparations: asepsis and antisepsis.

Pathology and Bacteriology:

1. Urinalysis.
2. Inflammation: elementary pathology of.
3. Tumors: varieties and peculiarities of each.
4. The micro-organisms: classes and peculiarities.
5. The non-pathogenic bacteria.
6. The pathogenic bacteria: streptococcus, erysipelas, three forms, staphylococcus, pneumococcus, tubercle bacillus; the spore-formers.
7. The processes and methods of infection.

8–11. The vaccines and serums—their processes of operation and methods of employment; immunity.

12. Use of blood-counters.
13. Use of hemoglobinometer.
14. Use of blood-pressure apparatus.

THIRD YEAR

Dietetics (diet kitchen work, especially as to special diets and feeding values, 10 lectures).

11. Milk: chemistry and physiology of milk.
12. Pasteurization and sterilization of milk.
13. Formulæ and compounds.
14. Feeding values of various milk combinations.

Obstetrics:

1. Pregnancy: process of ovulation and fecundation.
2. Signs of normal and abnormal pregnancy.
3. Complications of pregnancy: abortion, miscarriage, and eclampsia. The vomiting of pregnancy.
4. Labor—the phenomena of: stages, presentations.
5. Accidents of labor.
6. Abnormalities of pregnancy: anatomic malformations.
7. Abnormal labor. Forceps and their indications; placenta prævia; prolapse of cord; Cesarean section.

8–10. Care of the newborn child: emergencies.

11, 12. Care of the postpartum mother: genitalia, breasts, bowels, food.

Infants and Young Children:

1, 2. Anatomic and physiologic peculiarities of the infant.

3, 4. Inherited abnormalities: bony malformations; club-foot, rickets; skull deformities; cross-eyes, skin lesions; birthmarks.

5, 6. Care of the newborn and premature infant.

7, 8. Infant feeding: breast and artificial.

9. Faults of digestion and improper feeding.

10, 11. Malnutrition: gastro-intestinal disorders; summer complaint.

12. Ordinary diseases of childhood.
13. Exanthemata: diphtheria, whooping-cough.
14. Hygiene and care of the healthy child.

Nervous, Mental, and Special Diseases:

1. Care of the insane.
2. Care of "rest cures."
3. Nervous complications of medical cases.
4. Care of skin cases.
5. Care of diseases of the eye, ear, nose, and throat
6. Hygiene and preventive care of tuberculosis.

MALE NURSES

Those of us who practised medicine, or directed the affairs of hospitals, under the old régime, when the trained woman nurse was unknown, and when the male nurse was a composite of drunkenness and genius, wonder whether the change that has wholly eliminated the trained male nurse is for the best. There is no doubt that there is something stronger, more virile, more substantial, and certainly less finnicky in the male nurse than in the female. That tender touch that we are accustomed to sentimentalize about, that human sympathy that we are accustomed to associate with femininity, finds almost no resting place in the institution young woman nurse of to-day. Many times she is quite as heartless as the most heartless of the opposite sex. Oftentimes she is not more conscientious. Almost always she is subject to whims. She must be accorded more consideration, at the expense sometimes of the patient.

On the other hand, the male nurse has usually some overpowering failing, some inherent weakness, that forbids his success in any permanent line of human endeavor. In other words, the male nurse has been nearly always "a failure." Many times he has become a periodical drunkard. Sometimes he has been a bright young business man or mechanic or clerk, whose intemperate habits have brought him to the hospital, and, after repeated trials and repeated failures, he has found that his only safety lies in shutting himself out from the world, and subjecting himself to the discipline of the hospital or the eleemosynary institution. The most competent and reliable male nurse will oftentimes go along for weeks or months, attending conscientiously to his duties, taking most efficient care of patients, until in some unlucky moment he finds the whisky bottle in the medicine cabinet, and takes "just a drop to steady his nerves." The rest of the story is easily imagined. It has become a maxim that a trained male nurse would not be a nurse if he were fit for any other occupation, and that is probably true.

So that time and events, changed conditions everywhere, have practically eliminated the male nurse, except for certain special services and in special places. In the large general hospital even the term "male nurse" is rarely heard. He is an "orderly" now, and usually has all the weaknesses of the old male nurse, with rarely few of his good points, and the orderly, as we have come to know him, is a roving, restless incompetent, too often dishonest in a petty way, and rarely efficient enough to give the nurses very much intelligent help.

Of course, there are exceptions; there are a few male nurses in every city whose time is always employed at remunerative wages, some who make as much as $30 or $40 per week and are always busy; and there are a few orderlies in large hospitals that are competent men, sober, industrious and honest, who live in the institution, who save their money, who are accommodating in their work, kind to patients; but the work of even these few is gradually lowering in its grade. The male nurse used to catheterize, give enemas, do dressings, and, in rare instances, do minor surgery. Nowadays the woman nurse gives the enema, and since catheterization is included within the realm of aseptic minor surgery, either the doctor or his assistant performs that office for the male, while the woman nurse does it for the female patient. So that the orderly's work is almost reduced to a janitor's service. He mops the dressing-rooms and sometimes the wards and halls. He may occasionally give an enema to male patients. He helps lift patients, he puts them on the cart for transportation to the operating-room and back again. He is called to control delirious patients occasionally, by reason of his strength. He helps with the service of the meals, he carries the stores and the supplies to and fro, and otherwise makes

himself generally useful, and his compensation is usually $20 or $40 per month, with room and board in the institution.

As attendants on patients in insane hospitals and public eleemosynary institutions, there is very little to choose between men and the ordinarily employed women. The occupation in such institutions is brutalizing, and as the public is parsimonious and stingy about caring for its wards, and as charity commissioners are usually negligent where they are not ignorant, and as superintendents are too often political protégés of politicians, so, "like master like man," the attendant male and female are calloused, lazy, often dishonest, and rarely possessed of humanitarian qualities.

This is not a pleasant section to write. The ideality of the situation as compared with the reality is discomforting and discouraging. There is no reason why there should not be competent sober, industrious male nurses. The price of their service is usually regulated by the value of that service, and the value of the male nurse has receded, and has reached so low an ebb, along with his deficiency and his frailties, that in many institutions even the orderly has been dispossessed, and there are now only nurses and janitors, and this condition will increase, and male attendants in institutions will become rarer as the trained woman nurse becomes more efficient and more courageous in her activities.

RULES FOR TECHNICAL DEPARTMENTS

RULES for administrative procedure are scattered through these pages with regard to their specific employment and in the various proper places rather than under any very precise order as rules. The following rules for three special departments, it is thought, are so important that they had best be assembled at this place.

RULES FOR THE SURGICAL DEPARTMENT

Following are a few general rules intended to apply in the surgical rooms of the average general hospital, operating under the ordinary conditions in this country. These rules can be amended or elaborated or cut to meet special conditions.

GENERAL RULES

Visitors.—Physicians only shall be allowed to visit the operating suite while operations are in progress, and under no circumstances will a non-medical person, whether relative or friend of a patient or otherwise, be allowed to be present at a surgical operation without the specific consent of the superintendent of the hospital in each case.

Physicians are welcome in the operating department under the following conditions:

They must don visitor's coat or slip gown before going into the arena or into the private operating-rooms.

In the amphitheater visitors will confine themselves to the seats intended for the regular audience, and must not enter the arena except on specific invitation of the operator.

Visitors must respect the "private" sign on operating-room doors, and will enter only upon the specific invitation of the operator, or after permission from the head nurse of the department.

In attendance upon operations in the private rooms visitors must keep outside the zone set apart for nurses and assistants, and will come closer only upon invitation of the operator, and will immediately step back again after they have seen what the operator wished to point out.

In the "clean" rooms when a visitor has been invited into the atmospheric field of operation, he must be clothed in head-cloth and mouth-cloth, the latter covering nose, mouth, and beard.

Visitors must not assist in any way in the operating-rooms, unless specifically invited to do so by the operator, and must not touch trays, tables, or any of the paraphernalia for any purpose.

Visitors will enter the preparatory or anesthetizing rooms only upon invitation of the surgeon in charge of the case.

Schedules of operations are posted in the surgeons' dressing-room and in the visitors' locker room; the schedule book upon the head nurse's desk is private property, and visitors, whether staff members or not, are not expected to peruse it.

A room for visitors and a room for operators is provided; those who are not actually at work are requested not to loiter in the corridors of the suite, and will, under no circumstances, notice patients in transit.

Loud talking and unnecessary noise are prohibited.

Visitors to the city who desire to be called for any particular operations or for any surgeon's schedule must leave their telephone number with the head nurse, and arrange at the other end of the phone for the taking of the message when the number is called. Out-of-town men may be notified by telegraph or long-distance telephone twenty-four hours in advance when possible, at their expense.

Operators.—Surgeons who participate in the work of the hospital must adhere to the institution technic in so far as asepsis and the service of interns and nurses and preparation of patient are concerned; it is only in this way that an adequate asepsis and assistance can be maintained.

Operators are expected to accept the dictum of the head nurse in the scheduling of operations.

The operating schedule-book will be in the custody and under the control of the head nurse of the department, who will be held responsible for the proper scheduling and conduct of operations.

No operation will be set down for a time that would naturally make it lap over on another operation previously scheduled, and the head nurse must be the final judge as to this time.

Fifteen minutes' delay will be considered sufficient to meet all the requirements of the profession, and any operator who is more than fifteen minutes late for an operation will be considered to have forfeited his time, and must then wait until the regular schedule shall have been completed. His patient will be returned to bed.

Operators are expected to choose their instruments for any operation at least half an hour before the time set for the operation; otherwise the institution's regular tray for that operation will be picked and sterilized, and the operator will be expected to get along with those. This rule is made necessary to avoid unnecessary delays in sterilizing additional instruments.

Operators who require over-night preparation of patients, or who require special instruments or apparatus or dressings, must give orders in ample time, as delays cannot be allowed to make up for this delinquency.

Operators are expected to select and announce the anesthetic they wish to employ in ample time for preparation, and where "continuous gas" is to be used for private patients the operator is expected to inform his patient, or to have his intern do so, that there is a special charge for this anesthetic.

Operators are privileged to invite any physician to see them operate, but non-medical persons will not be allowed in the operating-rooms except by special permission of the superintendent of the hospital in each case.

The private assistant of any operator may assist him in any private case, but the institution reserves the right to have its own surgical interns scrubbed up and present for any emergency.

No non-medical person will be allowed to assist in the operating-rooms in any capacity whatsoever, excepting the regular nurses of the institution.

Any procedure in connection with a surgical operation that partakes of the nature of administrative technic, and varies in any way from the regular technic of the institution, must be announced to the head nurse before the operation begins, and must have her approval; any appeal on this point must be made to the superintendent of the hospital.

The Anesthetic.—No anesthetic will be commenced, under any circumstances, until the operator appears in the operating suite.

No outsider will be permitted to administer an anesthetic in the institution; the hospital maintains a corps of expert operators in this department, who are familiar with the rules of the institution and with the apparatus available for service.

Members of the house medical staff are not permitted to administer anesthetics until they have been passed as competent by the regular staff men on service.

In exceptional cases, where the operator has reason to anticipate difficulty with the anesthetic because of the patient's condition, one of the regular staff anesthetists on service must be called in, after due notice through the operator's intern, and in such case the operator may use his judgment whether the patient should pay a fee to the special anesthetist, but there is no obligation on the part of the patient to pay such fee except when previous arrangement to that effect has been made by the operating surgeon with his patient.

The regular staff anesthetists may be called upon to give an anesthetic in any case, after reasonable notice, and they are forbidden to send a bill to any patient for such service, except with the written approval of the operating surgeon as an endorsement on the bill, and, when such fee is permitted, it shall not be more than $10 in any case, unless specific arrangement to that effect shall have been approved by the superintendent of the hospital.

The Patient.—No patient, whether private or a patient in a free ward, shall be taken to the operating-room until the following conditions have been complied with:

(1) Written consent for the operation, signed by the patient, if an adult, and in mental condition to give such consent, on the regular "permit for operation" form of the institution; if the patient is under legal age, eighteen years in females and twenty-one in males, or, if the patient is unconscious or delirious or in such mental condition as to be unable to realize the gravity of the operation, the permit must be signed by the responsible person nearest of kin available; if there is no such person present or available, the facts must be stated to the superintendent of the hospital, who may use his discretion in issuing a special permit, on the face of which all the facts must be stated. This permit must be taken to the operating-room as a part of the regular record of the case. This permit must be had whether the anesthetic is to be general or local.

(2) No patient shall be taken to the operating-room without a complete urine examination, and the laboratory report must accompny the patient as a part of the record. In the event that a specimen of urine cannot be obtained for analysis, the superintendent of the hospital must be notified of the facts, and he may, in his discretion, issue a waiver permitting the operation, but the reasons therefor must be stated in the superintendent's handwriting on the permanent record of the case.

(3) No patient shall be taken to the operating-rooms until arrangements are completed, assuring the commencement of the operation within fifteen minutes after the patient's arrival there. If, for any reason, a longer wait is necessary the patient must be taken back to bed. This rule is to guarantee prompt attention to patients, so that they may not be kept under hurtful suspense unduly.

At the end of an operation no patient shall be taken back to bed without the attendance of a responsible medical man, preferably an intern of the institution.

No patient shall be left alone, for even the shortest interval, in the operating-room suite. A physician or nurse must always be present in the room.

Immediately following the operation, it shall be the duty of the first assistant

to the operator to see that the patient is removed from the table to the stretcher and properly prepared for the journey back to bed. He must likewise be convinced that the patient is in good condition before transfer to the stretcher is attempted.

THE CHILDREN'S DEPARTMENT

General Rules

Visitors.—Visiting time in the children's department shall be as follows:

Large (free) wards, 2 to 4 P. M., Wednesday and Sunday.

Small (private) wards, 1 to 8 P. M. daily, in the discretion of attending physicians.

Private rooms, without other limitations than the orders of attending physician.

In Isolation.—No visitors at any time, upon any pretext whatsoever (excepting in cases of impending death, and then under detailed supervision of the superintendent of the hospital).

Only the parents or guardian will be permitted to visit patients, excepting on the specific order of the superintendent of the hospital in each case.

Children will not be permitted to visit in the children's department.

Visitors of whatever class, whether parents, visiting physicians, or casual guests of the hospital, shall be clothed in the regulation visitor's gown of the institution before entering the rooms where there are sick children.

Visitors, whether parents or others, will not be allowed to handle the sick children, or to wait upon them, or to give them anything to eat or play with without the express permission of the head nurse in charge in each particular instance.

Note.—These rules relative to visitors do not apply to members of the young ladies' society detailed to entertain the children, and whose conduct is prescribed in special rules.

Admission of Patients.—No patient shall be admitted by the physician detailed in the admission rooms until a throat smear has been made and found negative in all cases, and a vaginal smear has been made and found negative in all female children. When either of these findings shall have been found positive, the superintendent of the hospital shall be immediately notified for discretionary action in the case.

Whether the smears prove positive or negative, it shall be the duty of the admitting physician to take cultures from throat and vagina, and send them to the incubator in the general laboratory of the institution for final treatment and report.

After admission, cultures from throat and vagina shall be taken each day for three days by the junior house physician, carefully examined, and the findings added as a part of the permanent record, and twice a week thereafter.

As soon as a patient has been admitted by the physician it shall be the duty of the admission nurse to remove all clothing in the presence of one of the house physicians in that service, whose duty it shall be to examine the body of the patient for bruises, eruptions, marks of all kinds, malformations and irregularities, and to make note of them on the history sheet as part of the routine physical examination. The nurse shall immediately thereafter, unless forbidden to do so on account of the critical condition of the patient, give it the regular bath prescribed, weigh the patient naked, clothe it in the hospital bed clothing, and put it to bed in the prescribed location.

After one hour the nurse shall take the temperature, pulse, and respiration, and record them as a part of the admission entry in the nursing chart.

Before the parents of the child shall have left the hospital it shall be the duty of the junior house physician to interrogate them on the history of the case, as prescribed under the rules for history taking, and to record their story in detail on the record. As soon as possible, and, in any event, within twelve hours after the admission of the patient, the junior house physician shall make and record a complete urine examination, and shall, in addition, examine the blood or such other excreta—fluids, tissue—as in his judgment are likely to prove of value in the physical examination to be made later by the attending physician.

As soon as the routine admission service has been performed it shall be the duty of the junior house physician to notify his senior of the admission of the patient, and it shall be the duty of the senior to see the patient at once. If it is a private case, he shall at once call the attending physician by 'phone, notify him of the admission of the patient and the present condition, and ask for orders. If it is a service (free) case, he shall at once make a complete physical examination, record his finding on the permanent record, according to the rule for making physical examinations, and, in his discretion, shall give the necessary orders, or call up the service attending physician, relate the facts, and ask for advice.

Every patient, upon admission, shall be assigned to a bed in one of the observation rooms of the department, and shall not, under any conditions whatever, be removed to a ward in which there are other children until so ordered by the attending physician in the service.

Care of Children.—Immediately upon admission, it shall be the duty of the admitting nurse to examine the patient carefully for head and body vermin. The general bath will be adjudged sufficient treatment for body lice; when found on the head, she will apply the institution's technic prescribed, and the treatment will be continued until the patient's head is free from them. But under no circumstances will it be permitted to cut a female patient's hair, except with the express consent of the parents or an order from the superintendent of the hospital.

A full bath, either tub or sponge, must be given every patient daily except on counter order of the physician.

Children's hair must be kept combed, and, in the case of females with long hair, it must be braided and neatly tied with ribbon or tape.

Finger- and toe-nails must be kept trimmed and neatly manicured at all times.

Tooth-brushes are provided by the institution for older children, who must be taught their proper use whenever their health permits, and the mouths and teeth of all children must be kept clean.

In the case of infants the nurse is forbidden to clean the mouths with her finger, but must use a soft mop made of wooden handle and absorbent cotton swab. The handle must be notched, so that the swab when tied on will not slip off. In the absence of special orders by the physician, a saturated boric acid solution may be used for mouth-wash.

Each child must have its own comb and brush while in the hospital, and the comb and brush that have served one child shall not be used again until they have been completely sterilized by soaking in a solution of 1 : 4000 bichlorid for at least six hours and then rinsed in clean soft water. Brushes and combs must not be boiled.

The genitals and buttocks of each infant must be given careful attention by washing in warmed water after each bowel movement and must be kept well powdered with talcum. The glans and foreskin of male children must be watched carefully and kept clean, and every female infant shall have a vulval pad in constant use, and this must be changed whenever wet or soiled. Any discharge in either sex must be communicated to the physician in charge.

Each child large enough to use bed-pan and urinal must have separate utensils of both sorts, and these must not be used for any other child. After each use they must be scalded and passed through the prescribed disinfecting utensil sterilizer.

Each child, large and small, shall have separate wash-basin, wash-cloth, cup, spoons, and dishes, and these shall be identified by number of bed.

Each child shall have its own thermometer, rectal for infants, and both rectal and mouth for older children, kept in proper receptacle at the bedside, and after each use it shall be washed and carbolized or disinfected in the institution's routine way.

When a patient is discharged all utensils and thermometers shall be passed through the special sterilizing process for the required time before being used again.

Infants' diapers must be kept, when containing bowel movement, in the special receptacle provided for them in the slop-sink room until the next visit of the attending physician; they must then be cleaned of feces, and placed to soak in 5 per cent. carbolic solution for twelve hours, then rinsed, and sent to the laundry for washing.

All linens in the children's department, bed clothing of patients, sheets, slips, and pads, must be soaked in 5 per cent. carbolic solution for twelve hours before being sent to the hospital laundry.

Nursing and bottle infants must invariably be fed by prescription of the physician as to time, amount, temperature, and kind of food, and at least once daily each nursling must be weighed naked before and after feeding to test the integrity of the method. No nursling must be left alone while feeding from the bottle; the nurse must remain and hold the bottle during the whole process, or, when the automatic bottle-holder is used, a nurse may watch and aid all the children in the ward while nursing.

Infants nursing wet nurse must be especially watched for weight, to see that the foster mother gives her charge an honest feeding.

Infants' mouths must not be washed after nursing except on the order of the physician.

Rules for Handling Wet Nurses.—In the modern hospital for children there will come many babies suffering from gastro-intestinal disorders, who, the doctors insist, cannot live unless they are fed mothers' milk, and for these cases many institutions are now finding it necessary to employ wet nurses.

Almost invariably these women are from the lowest classes of society; they are usually ignorant, and their standards are often very little higher than those of the lowest animals. Most of them are unmarried, and some of them even make a business of wet nursing, and to that end become pregnant and give birth to a new child as often as occasion seems to require. Of course, there is an occasional wet nurse who, from misfortune, has been obliged to seek employment of this character to tide over the time until her baby, with whom she has been left dependent, arrives at an age that will permit her to make a living in some other avenue; but the great mass of wet nurses must be handled within rigid rules, without much reference to sentiment of any sort, if they are to be of service to the institution in the feeding of sick babies. As a rule, the children of these wet nurses are healthy, and a considerable part of their food can be made up of formula milks without any harm to them, and, in any event, it is always necessary to know exactly what each woman can supply for the use of other children and her own, and to this end there are some very definite rules that can be laid down, and which must be insisted upon if the nurse's service in the institution is to be of any value.

First: The wet nurse is never permitted to have her child with her except at feeding time, and then for not more than fifteen or twenty minutes after the breast has been emptied as well as may be for the feedings of the children whom she is nourishing. Sick babies are not permitted to nurse from the wet nurses' breasts; the milk must be drawn by the wet nurse herself into a graduated bottle, a sufficient quantity in each bottle for the nursing of one baby, and the milk so drawn must be fed to the sick baby while it is yet warm; milk must be drawn in the presence of a nurse.

Second: Wet nurses must not be allowed to go to a general table for their meals, but must have their meals brought to them where they may partake of their food under the eye of a nurse who understands what their diet is to be. Wet nurses have precarious appetites, as a rule, and they are more likely than not to have a craving for something that will either diminish the amount of their milk or impart some condition that will make it disagree with the sick babies. Wet nurses should be fed on the plainest food, and the more protein in character the better it will be; rare meats, legume vegetables, whole wheat and cornbreads, milk, eggs, butter, and a sufficient amount of bulk foods to fill the stomach and thus make them satisfied; potatoes and bread are the chief of these latter.

Third: Wet nurses should be kept rigidly within regular hours in the institution. They should not be permitted to go out after night, because they will do indiscreet things, eat foods calculated to interfere with their efficiency as wet nurses, drink alcoholic stimulants, and so upset themselves generally that the milk supply will be diminished. On the other hand, the wet nurses should be made comfortable, and should be given a sufficient amount of work in the institution to keep them busy. They are disposed to resent restraint, and, unless their time is fully occupied, they will be sure to fret, and thus diminish their milk supply.

Fourth: The wet nurses should be obliged to observe the laws of health and cleanliness; they should be obliged to bathe regularly, and it should be the duty of the head nurse of the department to see that their bowels are kept in proper condition and that their genitals are clean and healthy.

Fifth: Wet nurses should never be employed until the Wassermann test has been made, and until a competent physician has given them a thorough examination, to determine the presence or absence of specific disease. They should never be permitted to go on duty with running ears, sore eyes, sore throat, bad teeth, or any discharge from a mucous membrane or any skin eruption.

Sixth: The wet nurse should be given a certain number of babies to feed, and, as long as her milk agrees with them, should be kept to the same babies without any admixture of the milk of any other nurse. A change of wet nurses has been known to destroy whatever gain had been made by a sick baby, and to cost the life of the child.

Seventh: The wet nurse that cannot produce at least 32 ounces of milk per twenty-four hours, in addition to what is required for her own baby, is not worth keeping, and there are many of them who produce twice that much or even three times.

RULES GOVERNING MATERNITY DEPARTMENT

These rules are created by the obstetrical staff of the Michael Reese Hospital, and are approved by the board of directors. They will, therefore, govern the conduct of all who have to do with the department, whether it be staff members, visiting obstetricians in charge of patients, interns, nurses, patients, or the public.

General Rules

No one will be permitted to perform any service in the maternity department of any character whatsoever who has bad or decaying teeth, any discharge from any mucous membrane, or any open sore upon any part of the body, or who has been within the sphere of any communicable disease within the past twenty-four hours.

No babe whose mother is a patient in the maternity department shall be taken out of the bounds of the department for any reason whatsoever without the consent of the attending physician in the case and the approval of the superintendent of the hospital; and no baby that has been removed under such consent can be returned to the department without the specific consent of the superintendent of the hospital; provided, however, that this rule shall not apply in cases where the mother occupies a room in another part of the hospital, in which case the babe must be carried, thoroughly wrapped up, directly to and from the nursery, without exposure at any point en route, and such child shall not be allowed in the room with its mother during the presence there of any other child under fifteen years of age.

Visitors.—The regular visiting hours are as follows: Large wards, Sunday and Wednesday, 2 to 4 P. M. Small wards, daily from 1 to 8 P. M. Private rooms, daily from 1 to 8 P. M.

Visitors in the large wards will be absolutely restricted to husband and parents of the patient.

In other parts of the department indiscriminate visiting is to be discouraged, and should be confined to the immediate family of the patient.

Children under fifteen years of age will not be permitted to visit in the department under any circumstances whatever.

No physician will be permitted to visit the patient of another physician in the department, except on specific invitation of the attending physician; provided, however, that this rule does not release the staff director of the department from observing the necessary supervision over all patients to maintain cleanliness and asepsis.

Visitors in the department, excepting those who call exclusively upon patients in private rooms, must wear the hospital sterilized gowns provided for the purpose; gowns from other parts of the hospital will not be allowed.

Visitors must not sleep in the maternity department under any circumstance. Relatives of critically ill patients may be provided for in other parts of the hospital.

Interns and nurses on duty in other parts of the hospital will not be permitted to visit the maternity department except by special permission of the head nurse and under rigid precautions.

Admission of Patients.—No patient shall be allowed to enter the precincts of the department, except in extreme urgency, until the house physician on duty in the department shall have examined her (not vaginally) to make sure she is free from infection. Immediately upon the entry of a patient in the hospital the proper house physician must be notified.

When a patient is admitted, clothes and all personal belongings must be labeled and registered, valuables given to the head nurse in charge of service, who shall take them to the office and receive receipt for same; in the event of neglect or loss to account for same, the head nurse will be held financially responsible. Clothing must be listed and sent to the storekeeper, who will receipt for same after checking, and who will be held responsible for all pieces receipted for. The head nurse will be held responsible for lost articles not listed.

Discharge of Patients.—No private patient shall be sent home or allowed to leave until explicitly discharged by the attending physician.

No bleeding patient, and no patient presenting any abnormalitity of any kind, shall be discharged except upon the explicit order of the physician in charge.

Patients must be discharged and prepared to leave the hospital so that they shall be at home before dark in the evening, that is, 7 o'clock in the summer and 4 o'clock in the winter.

No patient shall be allowed to leave the hospital unless patient and baby are comfortably clothed, considering the season.

No patient shall be allowed to leave the hospital without an escort competent to see her and her baby safely home under every circumstance.

No patient shall be allowed to leave the hospital without a definite destination, and without abundant assurance that she and her baby will be properly cared for.

Consent for Operation.—No instrumental delivery, or delivery by surgical interference, will be permitted under any circumstances without competent consent in writing of the patient; if the patient be incapable of giving intelligent written consent, same must be obtained from husband or other responsible relative, and, in the absence of any of these, the attending physician must avail himself of the counsel of the nearest available physician in active practice, both of whom shall sign a statement of the facts in the case. If there is no such available consultant, the facts must be communicated to the superintendent of the hospital, who will sign a special permit, setting forth the facts in the case for any legal review that may follow.

Isolation of Mother and Baby.—Whenever any infection shall occur in mother or child the superintendent of the hospital must be notified, and patient and babe shall be at once completely isolated to the satisfaction of the medical staff. If this cannot be done satisfactorily, other accommodation must be found, and patient and babe removed at once. The medical staff of the department shall be the judge of what is an isolatable infection and what is satisfactory isolation.

No private patient shall be transferred from the maternity department to make room for another patient without the consent of the attending physician, and the manner and place of removal shall be satisfactory to the patient and her attending physician.

Circumcisions.—The operation of circumcision shall be performed in the maternity department precisely in the manner and under the asceptic technic of the surgical department of the hospital.

All operators shall scrub their hands with brush and marble-dust soap for twenty minutes, cleaning finger-nails thoroughly. They shall wear the regulation operating-room gown and rubber gloves. Their instruments, thread, and dressings must be sterilized by the nurses in the department in the usual way. Bleeding vessels must be carefully tied, and the parts must be stitched and the operation performed in every way according to accepted aseptic surgical procedure.

If the operation is performed as part of a religious rite, the operator must agree in writing beforehand, and the agreement made a part of the record of the patient, that he will perform the operation strictly in accordance with the above rule.

There may be three persons present at any circumcision beside the hospital assistants, of whom the operator shall be one; the others may be selected by the family of the child.

No circumcision shall be performed on any child who is not perfectly healthy.

No person shall perform the operation of circumcision without the written consent of mother or father, and said written permit shall state who is to perform the

operation, and the written permit must be made a part of the permanent record of the case.

No person not connected with the hospital shall be allowed to perform the operation of circumcision until he shall have signed an agreement to abide by the rules of the hospital as to asepsis and methods of cleanliness and technic.

No intern shall perform the operation of circumcision without the express consent of the staff obstetrician on duty in the department at the time, and never without the written consent of one parent.

Authority in the Maternity Department.—The obstetric staff of the Michael Reese Hospital will be responsible for the medical and scientific conduct of the department, and will have full authority to that end.

The physician in charge of each case will give whatever orders he may desire relating to his own patient, and they will be carried out by interns and nurses, unless they are in violation of these rules, in which case the person to whom the order is given will notify him of the rule, and, if the physician persists, the head nurse of the department will be notified, and, if the physician still persists, the superintendent of the hospital will be at once notified of the facts.

Interns on duty in the department are supposed to know the wishes of visiting physicians in relation to their patients, and their orders will be carried out, subject only to countermand by the head nurse of the department until the attending physician can be reached for a final decision.

The Head Nurse.—The head nurse of the department shall be in direct charge of all the work. She shall be held responsible for the technic, excepting that of attending physicians and interns, and her orders in every case, and under all circumstances, shall prevail, subject to approval (1) by the medical staff in relation to medical and scientific matters, (2) the attending physician in regard to any individual case, and (3) the superintendent of the training-school in all matters in relation to the nursing of patients and the nursing technic of the department.

The head nurse shall be in charge of all supplies of every description, and shall be held responsible for their economic and proper distribution and use.

The head nurse shall be responsible for the cleanliness and asepsis of the department and all its belongings, and, to that end, will be in authority over all the orderlies, floormen, and maids, as well as nurses who are detailed for duty there.

The head nurse must conduct drills of technic and in the conduct of typical cases at intervals when the department is not busy.

In the event of a difference of opinion between the head nurse and a visiting physician or an intern, she shall at once notify the superintendent of the training-school, or, in her absence, the superintendent of the hospital, for a decision of the question.

The head nurse shall report all abnormalities of patients and unusual conditions to the house physician at once, and to the attending physician on his next visit.

In addition to her other duties, the head nurse shall keep a book in which she shall record all mooted questions that may arise appertaining to the conduct of the department, to the end that the rules may be amended from time to time.

Rules for Attending Physicians.—Physicians working in the maternity department, whether members of the medical staff of the Michael Reese Hospital or otherwise, must conduct their cases, in so far as operative technic is concerned, in strict conformity with these rules.

Attending physicians are expected to visit their patients daily.

For the protection of the department, and to safeguard its asepsis and cleanliness, the staff member on service is directed to inspect all parts of the premises at

frequent intervals, and to maintain sufficient watchfulness over the work of attending physicians and over their patients to guarantee this result in the conduct of the department.

The staff physicians are expected to co-operate with the hospital in the taking and keeping of the prescribed records, and to frequently inspect such records to see that they are being adequately kept.

Attending physicians are urged to call consultations freely in difficult cases, not only to protect their own interests in a medicolegal sense, but to divide responsibility. Service members of the staff are urged to call freely upon the advice and counsel of their confreres, not only for the above reasons, but in order to share their experience in regard to interesting cases.

Physicians are urged to read carefully all rules of the department, to the end that they may not be embarrassed by the refusal of the interns and nurses to obey their orders.

Rules for Interns.—The division of labor between seniors and juniors will be made as in other parts of the hospital, excepting that no junior shall conduct a case of labor unaided until pronounced competent by his senior.

In case of abnormality, the junior must immediately notify his senior and take orders in relation thereto. The senior intern must immediately report any abnormality to the obstetrician on service, if it is a service case, and to the attending physician in a private case. If the regular attendant cannot be located, another staff member must be called, and, if none can be found, the superintendent of the hospital must be notified of the facts. In a private case, if the attending physician cannot be located in an emergency, the superintendent of the hospital must be notified.

The intern on duty, and who has begun a case of labor, must remain within easy call of the nurses until the case is over, or until he has expressly resigned the case to another intern and has notified the nurses to that effect. In the event that an intern does so resign a case in favor of another, he must write the conditions of the patient as they exist at the time he leaves the case, and said written directions must be made a part of the permanent record of the case.

An intern who has begun as a participant in an abnormal case will under no conditions whatsoever leave until the case is concluded.

Interns are not allowed to reprimand nurses. Any incompetence or neglect of duty must be reported to the head nurse.

Interns on duty in the maternity department are forbidden to visit the morgue, to be present at any autopsy, whether human or animal, and are expressly forbidden to participate in any pus operation or dressing except under conditions that may be prescribed by the medical staff of the department.

Books used by interns during student days, such as anatomies, books on pathology, and physiology, shall not be brought into the maternity department.

The intern on duty must make rounds twice daily in all cases, and as much oftener as may be necessary.

Rules for Maternity Nurses.—All pupil nurses on duty in the maternity department will be under the direct jurisdiction of the head nurse of the department.

In the absence of the head nurse a senior pupil nurse must be left in charge, whose orders will be as implicitly obeyed by other nurses as though given by the head nurse direct, and whose authority in the department will follow that of the head nurse. Whenever a pupil nurse in charge of the department meets an emergency she will call first the intern on duty, then the superintendent of the training-

school. In an extreme case she will call the attending physician directly to save time.

The nurses conducting a labor must be gloved and gowned.

Graduate Nurses.—Graduate nurses on duty in the maternity department must consider themselves subject to the same rules as those governing the pupil nurses.

They will take orders from the head nurse of the department, and will report to her any unusual or abnormal condition in either mother or child in their care.

In an emergency, the graduate nurse in charge of a patient may report directly to the physician in charge of the case if she is unable to secure the presence of an intern promptly. After calling the physician she must report the emergency to the head nurse.

On being summoned to the maternity department to take charge of a case the graduate nurse must first report to the superintendent of the training-school, and then to the head nurse of the department.

The graduate nurse will not take charge of her patient's delivery except on express request or invitation of the head nurse.

Graduate nurses will consult the head nurse of the department before going off duty or accepting relief.

Technic of the Department.—*Before Labor.*—Vaginal examination on waiting women must be made once only except in emergency, and then with same precautions as in labor.

Measurements of pelvis, inspections of abdomen and breasts, must be accurately made immediately upon the admission of a patient, and the finding recorded in detail.

Urinalysis must be made on all waiting women at least three times a week, and oftener if necessary.

History in detail, with all external measurements, should be secured in all private cases, when consent of patient can be had, and the same accurately recorded.

Soapsuds enema must be given, and, if the patient is in labor, she will use jar, and if not, use toilet. After bowel movement, give the patient a full bath unless membranes are ruptured or her condition is too serious, in which case, and completion of labor not imminent, give bath with seat in the tub.

If the patient is in labor and the membranes are ruptured she must be immediately put to bed, unless otherwise ordered.

Never catheterize unless ordered. Never use glass catheter on patient in labor; catheterize under running water if possible.

Have patient urinate in clean jar as soon as admitted; note quantity, color, and odor. Save entire amount for laboratory examination. Scrub patient's hands and the arms up to the elbows, clean and trim finger-nails and also toe-nails if possible.

Never touch genitals, instruments, or linens unless hands are sterile.

The Labor.—Prepare two sets of three basins each. First set: (1) Basin 50 per cent. alcohol; (2) basin 1:4000 bichlorid; (3) basin ½ per cent. lysol. Second set for hands and rubber gloves: (1) Basin 1:500 bichlorid; (2) basin sterile water; (3) basin ½ per cent. lysol and cotton.

Always have float in bichlorid basin.

The genitals should be carefully shaved.

Both hands must be gloved at every examination. No delivery can be permitted in the department without gloves; this rule applies as well to staff members as to visiting physicians in attendance on private patients.

Every stage of every abnormal labor must be recorded accurately, and made a part of the permanent record of the case.

Never leave a patient while in labor. She must be constantly attended, to guard against hemorrhage, eclampsia, ruptured uterus, etc.

Record pains every hour, as to frequency, duration, and character.

Record every examination during, as well as before, labor, by whom made, and finding.

Vaginal discharge during labor must be accurately recorded as to color, quantity, and character.

There should be as few examinations as possible, and always under extreme precautions.

Record fetal heart sounds every hour as to frequency, character, and location.

The head should be delivered with patient on her side. The third stage of labor should not be interfered with for thirty minutes unless for some very valid reason, such as hemorrhage, impending death, etc.

If patient is bearing down when she ought not to, place her on her side; to hold her back interlock fingers of both hands, cover genitals with hands in rubber gloves.

Cover genitals of patient in labor with sterile pads. Touch these pads only at edges and with sterile hands. Keep genitals clean with ½ per cent. lysol.

All linen and clothing of every sort coming in contact with patient in labor must be sterilized.

After Delivery.—Mother and babe must be immediately and carefully tagged by numbered sewing tape on wrist of each.

The babe and placenta must be examined and measured at once, and findings accurately described as a part of the permanent record of the case.

After birth of child patient should be assisted to turn on back from side, with her knees closed, and the nurse's hands on fundus uteri. Fundus should be held, not manipulated, however, for thirty minutes. Then, and not until then, accoucheur should deliver placenta.

Fundus should be held for another thirty minutes before putting abdominal binder on. If bleeding is in the least profuse, nurse should report same to head nurse at once, certainly before applying binder; to do so, however, she must not let go her hold on the fundus.

One dram of ergot is given to all patients immediately after delivery of child, and 5 minims should be given to all primiparæ every six hours for three days postpartum.

Care of the Mother.—Nurses ought first, in taking care of the mother, attend to breasts, then give enema if directed, then clean parts again and apply binder. An enema ought not to be given to a delivered woman, however, unless specially ordered by the physician.

The breasts should be placed in the breast-binder after the first nursing, which should occur about eight hours after the birth of the child.

Nipples should be cleaned before nursing with boric solution. Hands of nurse or patient should never touch nipples, nor should they be touched by clothing. They should be kept covered with sterile cloth.

Temperature, pulse, and respiration of the mother should be taken and recorded three times a day, and oftener if necessary.

Diet of patient should be light soft diet for two days. After that generous diet, avoiding alcoholics and fruit.

Patients should not rise until ninth day; then out of bed if condition permits.

Each patient should have her own nipple shields and boric solution pan.

Always keep patient's knees together when turning in bed.

Empty bowels on third day.

Full bath should not be allowed until after three weeks. Until then use bed-bath, sponge, etc.

Vulval pads must always be changed before the outside has become moist.

Every patient must be examined before leaving the hospital, and findings accurately described as a part of the permanent record.

No patient with the least departure from normal must be allowed to leave until the attending physician has been notified of the facts and has approved the discharge. In such case, the facts with the physicians' decision must be stated on the record.

Care of the Baby.—*Eyes.*—Immediately after birth of babe, holding babe on lap with eyes looking upward, drop one drop of 2 per cent. solution of silver nitrate into each eye, then following with a flushing of normal saline, always using sterile cloths.

Cleanse eyes daily with 2 per cent. boric acid solution, wiping toward nose.

Cord.—Dress cord daily with 10 per cent. salicylic acid in starch, using sterile lint and flannel bandage. Always cover babe's face when powdering cord. Keep cord dry.

Temperature.—To be taken per rectum at birth and twice daily thereafter, A. M. and not earlier than 4 P. M.

Weight.—Weigh immediately after birth and once daily thereafter before bath and morning feeding; care should be taken to see that same weight of clothing is used with each weighing.

Bath.—The first bath is to be of sterile lard. Afterward a daily sponge bath until cord is off and umbilicus dry; then a daily tub bath, 98° F., disinfecting tub with 5 per cent. phenol before each bath. Nurse to scrub hands with green soap and disinfect with bichlorid, 1:5000, before each bath.

Once daily after morning baths boil all tubs and basins used in nursery. If babe is circumcised give daily sponge-bath until healed.

After lard bath finish dressing babe and place on side between blankets. Keep head covered and lowered for from twelve to twenty-four hours. Then place in its own bed, numbered same as tape on wrist of mother and babe. *Always place babe in its own bed.*

Never put hot-water bags next to any part of a babe.

Mouth.—Look into mouth morning and evening. Never wash mouth unless ordered to do so.

Bowels.—Note time of first stool and urination. Babe should have at least two stools daily.

Circumcision dressing to be changed once daily or oftener if necessary.

Feeding.—Put babe to breast eight hours after birth and once again during first twenty-four hours—afterward nursing every three hours during day, not waking at night unless ordered. Give sterile water, 1 to 2 ounces, twice every twenty-four hours.

THE SURGICAL OPERATING-ROOMS

If there is to be competent surgery in an institution, and if the best interests of patients are to be conserved, there must be definite rules for the conduct of the department, no matter whether the operators be exclusively staff members or members of the profession at large in the community.

Nearly every surgeon, and, indeed, nearly every medical practitioner, in whatever branch, thinks his own case at hand is a very special one and entitled to the right of way over all others. These men are right, and it is according to the highest ideals of the profession that they should feel so. But a still larger duty devolves on the institution management, that has for its end the best possible conditions surrounding every case coming for surgical care, and such conditions cannot be achieved by granting special concessions to one or a few men at the expense of all the others. Hence, the very first necessity in the proper conduct of a surgical department is to place every operator on the same plane, so that each one shall have every facility of the institution for the care of all his patients, rich and poor alike, and all the time.

Ordinarily it will not be an easy thing to hold a rigid rein over busy men, many of whom will aggressively make demands for special service and extra time and more nurses and assistants than the institution affords, and oftentimes for more than there is any real need; and it may be suggested that the only way to take the burden of such rigorous rules off the operating-room heads and off the shoulders of the superintendent of the institution is to place the responsibility on the surgeons themselves by having the staff adopt the rules by formal action, and this action can be clinched by the approval of the board of directors or trustees. Men will oftentimes approve a course of conduct in the abstract at a time when there is no case in point, when they will not be so reasonable in the absence of such formal rule when they and their patients are the particular objects of the rule in some special emergency.

Under the head of Hospital Rules, to be found preceding, we will include rules for the surgical operating-rooms. Just now, let us take up the preparation of material and the general conduct of the department.

PREPARATION OF MATERIAL

Gauze, Bandages, Drum Material

Sponges and Plain Gauze.—There are two kinds of sponges—gauze strips and laparotomy sponges.

Gauze strips are made 8 inches wide and 1 yard long, the width of the material. These are used for mopping until the peritoneum is opened, when laparotomy sponges are used. The gauze strips are to be tied in packages of 10 (ten), to be counted by two nurses, and name of each nurse on a slip of paper and left in package. The bundles of 10 are tied in unbleached muslin squares, 16 by 16, and marked "Ten (10) gauze sponges." They are then washed and boiled with Labarraque and soap for one hour, followed with sterilization for forty minutes.

Laparotomy Sponges.—Laparotomy sponges are made in three sizes: 11 inches square (5); 8 inches square (4); 4 by 7 inches (1-stitch sponge).

These sponges are made eight thicknesses. The edges are whipped, and the sponge is then quilted across. On one corner of every sponge there is a tape 12 inches long, used for hanging on sponge rack. These sponges are always used wet, with warm normal salt solution, 110° or 112° F.

Making up Sponge Drum.—*Sponge drums* contain 20 bundles gauze strips (10 sponges in each bundle), 8 bundles laparotomy sponges (10 sponges in each bundle), and two long packs.

Hysterectomy Gauze.—Cut gauze, 20 inches by 1½ yards. Fold until gauze is 2½ inches wide. Attach black silk, No. 18, to inner end of roll. This gauze is done up in blue paper, marked "hysterectomy gauze," and sterilized for forty minutes for three successive days, 10–20–10.

Long Pack.—The long pack is 5 yards long by the width of gauze, folded 4-ply.

Laparotomy Binder Package.—The laparotomy binder package is made up as follows:

(1) Three gauze strips, 7 inches wide and 1 yard long, are folded three times, making three pads of 8 thicknesses each, about 4 by 7 inches.

(2) Three pads, made up of pieces of gauze 12 inches wide and 1 yard long, folded into four thicknesses, making a pad 8 by 12.

(3) Combination made up of two pieces of gauze, 14 inches wide and 10 inches long, on each side of heavy cotton wadding.

These are all rolled in the laparotomy binder, with the small ones inside and the larger ones outside. They are enclosed by the wadded pad, and over all is the binder, so that when the package is opened they can be reached in the proper order. Sterilize 10–20–10.

Contents of the Laparotomy Drum.—Ten towels; 4 large sheets; 1 small sheet; 1 stomach sheet; 1 pillow case; 10 towels; 4 gowns; 1 sheet; 2 towels.

These are put in top downward, so that when the drum is opened the first articles will be two towels for wiping nurses' hands; next, one sheet for covering table, allowing the gowns and towels to be laid out for the surgeon and his assistants; then the sheets for covering patient, who is brought into the room prepared and anesthetized. At the bottom are ten towels for protection of the field of operation.

Sterilization for Laparotomy Drum.—Vacuum, 10; steam, 20; vacuum, 10.

Formula Gauze.—There are three kinds of formula gauze: Iodoform, wide and narrow; viaform, wide and narrow; xeroform, wide and narrow.

The wide gauze is cut 1½ yards by 9 inches, 8 strips to 3 yards. The narrow gauze is cut 1½ yards by 4 inches, 18 strips to 3 yards.

Wide and *narrow iodoform, iodoform Mikulicz drain,* and *iodoform selvedged* are prepared with the following:

Iodoform		27 gm.
Glycerin	60 c.c.	75 gm.
Alcohol	210 c.c.	168 gm.
Sterile water	90 c.c.	90 gm.
Gauze		130 gm.

This makes a little over 5.5 per cent., allowing for inequalities in gauze, etc.

Wide and *narrow viaform* are prepared with the following:

Viaform		27 gm.
Glycerin	60 c.c.	75 gm.
Alcohol	210 c.c.	168 gm.
Sterile water	90 c.c.	90 gm.
Gauze		130 gm.

Wide and *narrow xeroform* are prepared with the following:

Xeroform		27 gm.
Glycerin	60 c.c.	75 gm.
Alcohol	210 c.c.	168 gm.
Sterile water	90 c.c.	90 gm.
Gauze		130 gm.

Bandages.—*Spica Bandages.*—The muslin for spica bandages is cut 10 yards long by 4 inches wide, then kept in a roll. It is not sterilized.

Plaster-of-Paris Bandages.—Plaster-of-Paris bandages are cut: Two inches by 6 yards; 3 inches by 6 yards; 4 inches by 6 yards.

Cut wadding is rolled on before the plaster of Paris is put on in any of the following sizes: 2-inch by two lengths; 3-inch by two lengths; 4-inch by two lengths.

SOLUTIONS

Labarraque:

12 ounces chlorid of lime and 6 pints cold water.
16 ounces soda and 2 pints boiling water.
After stirring each solution thoroughly allow them to settle. Strain and pour together. Then strain through filter-paper. Keep in glass-stoppered bottles.

Schleich:

Formula No. 1.

Cocain HCl	.2
Morphin	.02
Sodium chlorid	.2
Aqua dest	100.0

Formula No. 2.

Cocain HCl	.1
Morphin	.02
Sodium chlor	.2
Aqua dest	100.0

Formula No. 3.

Cocain HCl	.1
Morphin	.005
Sodium chlorid	.2
Aqua dest	100.0

Harrington:

Commercial alcohol	640 c.c.
Hydrochloric acid	60 c.c.
Water	300 c.c.
Corrosive sublimate	0.8 gr.

Gelatin (2 per cent.):

Knox gelatin	20 gm.
Normal salt solution	1000 gm.

Dissolve gelatin in 140 c.c. salt sol. Add sod. hydrox. sol., few drops, until it turns red litmus blue. Add remainder of salt sol. and heat to boiling.

Thiersch:

Boric acid	210 gm.
Salicylic acid	40 gm.
Tr. ferri chlorid	q. s.
Dist. water to make	4000 gm.

Dissolve the acids in the water and add of tr. ferri chlor. to make purple color.

Bichlorid:

Bichlorid 1:6000 is the strength in general use in operating-rooms.
2½ ounces of the 1:500 solution to 1 quart sterile water makes a 1:6000.
10 ounces of the 1:500 solution to 1 gallon water makes 1:6000.
30 ounces of the 1:500 solution for one of the plungers, which holds 3 gallons.

Boric Acid Saturated (5 *per cent.*):
Boric acid crystals to gallon of water.

Iodin:

Lysol:
Use 15 c.c. to sufficient water to make 1000.
For 1½ per cent. use 1½ ounces to quart of water.

Ringer's:

Potassium chlorid	2.4	4 c.c. to 1000 c.c. normal saline.
Calcium chlorid	7.2	
Aqua dest.	120.0	

Locke's:

Sodium chlorid	0.9
Sodium bicarbonate	0.02
Calcium chlorid	0.024
Potassium chlorid	0.03

Four c.c. to 1000 c.c. of normal saline.

Carbolic Acid (5 *per cent.*):
Carbolic, 86.4; 232 c.c. to 4000 c.c. of water.

Beta-eucain:

Beta-eucain	0.1
Sodium chlorid	0.8
Aqua dest.	100.0

Sterilization of Solutions:
Cocain, any per cent.
Beta-eucain.
Schleich solutions.
Ringer's solutions.
Locke's solutions, etc.

Put cotton stoppers in bottles. Place in basin of warm water (with corks). Boil over flame for thirty minutes. Replace sterile corks and label.

Temperature of Solutions:

Basins (ordinary irrigating)	108° F.
Intraperitoneal salt solution	108° F.
Intra-uterine douches	115°–120° F.

Silk and Silkworm, Horsehair, Melted Wax, Etc.

Horsehair.—Boil for ten minutes. Keep in sterile absolute alcohol.

Preparation of Silkworm.—Color with saturated solution pyoktanin; rinse well; boil ten minutes; keep in alcohol 95 per cent.

Black and White Silk.—Boil for ten minutes. Dry thoroughly. Put up in small envelopes. First wrap in paper. Sterilize 5–10–5 three successive days.

Black Waxed Silk.—Boil in carbolic 5 per cent. to remove dye for ten minutes. Dry and rinse thoroughly. Wind on cards. Dip in (sterile) melted beeswax and carbolic 10 per cent. Wrap in waxed paper. Seal in clasp envelopes. Sterilize same as white silk.

Melted Wax for Silk.—Carbolic 10 per cent.; pure beeswax.

All Silk Sterilized.—Vacuum, 5; steam, 10; vacuum, 5. Boil for three successive days.

Horsley's Wax.—Salicylic acid, 1; olive oil, 1; beeswax, 7. Boil one hour. Strap jar with adhesive.

Rubber Goods—Care of

Rubber Tissue and Oiled Muslin.—Soak in bichlorid, 1: 500 for thirty minutes. Dry in sterile towel. Place in sterile cloth.

Sterilization of Catheters.— Urethral and Prostatic.—Place in formalin 40 per cent. for one hour. Seal with adhesive. Rinse in sterile running water.

Drainage (Various)

Bullet Drains.—Light-weight rubber dam about 4 by 7, covered with wide iodoform gauze, and a piece of small drainage-tubing just tacked to the center of the rubber dam.

Jacket Drain.—A piece of ¼-inch rubber tubing cut spirally, and two pieces of iodoform selvedged, inserted in the center of the tube. It is then wrapped with iodoform selvedged and covered with rubber tissue.

Cigarette Drain.—A piece of ¼-inch tubing, perforated, wrapped with iodoform selvedged, and covered with rubber tissue.

Soap

Marble-dust Soap.—Cut rosin soap, 750 grains; warm water, 1500 grains. Melt and boil for one and one-half hours. Add wax and stearin paste of each 150. Lastly, add marble dust, 7000 (15 pounds). Sterilize when boiling.

Green Soap.—A fair grade of green soap is made mostly of cotton seed and corn oil, softened by as much linseed oil as the prices proposed can stand, and the soap is made slightly alkaline in reaction, and when bought is not greater than 38 to 40 per cent. moisture, because otherwise we are paying an unnecessary amount for water. The green soap for operating purposes is made by boiling the soap with a sufficient quantity of water added to give the desired thickness. If it is to be used in beer-mugs or big-mouth bottles, and is used rather carefully by the surgeons, it can be made thick, and a thick soap has advantages. If it is to feed from one or another of the patent wash-basin soap feeders it will have to be made very thin, in order not to clog the outlet of the mechanism.

It is highly disadvantageous to use a soap that is green in color, which some dealers sell on the reputation that the color is from the natural olives. There is no green soap colored by olives that can be purchased at anything like a price that brings it within the reach of any institution. The green color in all these soaps is a grass stain.

The Making Up of Trays

Amputation Instruments

2 saws (large and small).
2 saws (chain and Gigli).
Amputation knives.
2 bone-cutting knives.
2 lion-jaw forceps.
1 bone-holding forceps.
Gouges.
Chisels.
Mallet.
1 three-tailed retractor.
1 periostotome.
1 sequestrum forceps.

Special for Cranial Work

Galt's conical trephines.
2 hand drills and points.
Bone-gouging DeVibiss forceps.
1 chisel and gouge.
1 mallet.
2 bone-cutting forceps.
1 periostotome.
Saws (chain and Gigli).
1 sequestrum forceps.

Emergency Tray

2 aneurysm needles.
2 curets.
2 single volsella.
2 double volsella.
3 8-inch clamps.
4 dull retractors.
2 flat retractors.
2 sharp retractors.
1 Kocher director.
2 pair tissue forceps, plain.
2 pair tissue forceps with teeth.
2 pair tissue forceps without teeth.
1 grooved director.
1 tenaculum.
2 probes—1 large, 1 small.
1 needle forceps.
6 curved snaps.
6 pair straight snaps.
Needle-holder.
1 intestinal forceps (rubber tip).
12 rat-tooth snaps.
1 curved forceps, large.
1 suture dish.

Add for hernia—bladder sound.
Add for kidney cases—pedicle clamp.
Add for gall-bladder—trocars and stone curets; 1 Murphy button; 1-inch forceps; have ready potain aspirator.
Add for stomach and intestinal cases—intestinal and stomach-clamps, protected with rubber tubing.

Curettage Tray

1 small Sims' speculum.
1 large Sims' speculum.
7 flat retractors.
1 intra-uterine douche point.
1 large dilator (Goodell).
1 small dilator (Sims).
1 set dilators (Hegars).
3 applicators.
Curets, all kinds and sizes.
1 stone forceps.
4 polypus forceps.
1 curved dressing forceps.
1 uterine sound.
1 medium bladder sound.
3 8-inch clamps.
3 double volsella.
3 single volsella.

Have ready tr. iodin; tr. iodin in carbolic acid; zinc chlorid, 50 per cent.

Perineorrhaphy—Trachelorrhaphy—Colporrhaphy

Curettage instruments, and
2 tissue forceps with teeth.
2 tissue forceps without teeth.
1 long tissue forceps.
6 curved artery snaps.
6 straight artery snaps.
6 rat-tooth artery snaps.
1 needle forceps.
1 tenaculum.
1 probe.
2 lateral retractors.
4 5-inch snaps.

Gynecologic Laparotomy or Vaginal Hysterectomy

All curettage instruments, and
9 8-inch clamps.
3 angle clamps.
3 straight 5-inch clamps.
1 uterine sound.
2 bladder sounds.
1 straight dressing forceps.
1 curved dressing forceps.
2 tenacula.
1 needle-holder.
Artery snaps—straight, 6; curved, 6; Kocher, 12.
2 tissue forceps with teeth.
2 tissue forceps without teeth.
1 probe.
1 grooved director.
1 polypus forceps.
3 trocars.
1 intestinal forceps.
Long slender forceps for a ventral fixation.
3 pedicle clamps.
2 large double volsella.
1 Kocher director.
Scissors—1 dressing; 1 perineorrhaphy; 1 curved; 2 angle.
1 long tissue forceps with teeth.
1 long tissue forceps without teeth.
2 lateral retractors.

Rectal Vaginal Fistula

Small emergency tray, with curettage instruments, and 2 small tissue forceps.

Hemorrhoids

6 rat-tooth artery snaps.
2 straight artery snaps.
2 curved artery snaps.
2 pair tissue forceps with teeth.
2 pair tissue forceps without teeth.
1 hemorrhoid clamp.
2 8-inch clamps.
Needle forceps.
Small Sims' speculum.
Have cautery ready.
6 straight artery snaps.

Tracheotomy Instruments

2 flat retractors.
2 sharp retractors, 3 prongs.
2 sharp retractors, 2 prongs.
4 sharp retractors, 1 prong.
3 knives.
1 aneurysm needle.
1 grooved director.
1 probe.
1 curved scissors.
1 angle scissors.
1 stitch scissors.
2 pair tissue forceps without teeth.
2 pair tissue forceps with teeth.
1 Eustachian catheter.
2 dilators.
2 sponges.
Tracheotomy tubes, all sizes.
2 curved artery forceps.
2 straight artery forceps.
Tape, catgut, silk, needles, gauze for packing, medicine-glass, iodoform gauze, gauze.

Tent Insertion Tray

1 8-inch clamp with safety-pin.
1 applicator.
1 uterine sound.
1 double volsella.
1 single volsella.
1 stone forceps.
1 Sims' speculum.
2 retractors.
Sterilized tents (all sizes).
Cut cotton.
Alcohol lamp and matches.
Lysol solution, ½ per cent.
Sterile gloves.

Eye Operations

The surgeon selects his own instruments. Have ready—

(1) 2 per cent. boric in basin (warm).
(2) 4 per cent. cocain (sterile).
(3) Adrenalin.
(4) Atropin sulphate, 1 per cent (sterile).
(5) Eye-pads.
(6) Medicine-glasses and droppers.
(7) Eye needles.
(8) Plain catgut, No. 0 and No. 1 black silk.
(9) Sterile vaselin.
(10) Sterile cotton and bandages.
(11) Fine sharp knife.

Nasal Operation Tray

The operator selects his own instruments in each special case. Have ready—

(1) 2 medicine-glasses and droppers.
(2) Cocain (the percentage the surgeon requires).
(3) Adrenalin.
(4) Sterile olive oil—large glass.
(5) Posterior tampons.
(6) Bernway's sponges.
(7) Powder-blower.
(8) Iodoform and xeroform gauze.

Adenoids and Tonsils

7 sponge-holders.
2 mouth-gags.
1 tongue depressor (large).
1 tonsil gouge.
Adenoid forceps.
2 Gottstein curets.
2 tonsil knives.
1 tonsil volsella.
2 tonsil volsella.
1 tonsil hook.
1 large glass.
Adenoid sponges.
Cut gauze.

Stitch Tray

1 pair stitch scissors.
1 pair curved scissors.
2 pair tissue forceps (1 with teeth, 1 without).
2 pair artery snaps (1 straight, 1 curved).
1 long artery snap.
1 probe.
1 grooved director.
1 sharp retractor.
1 dull retractor.
1 scalpel.

Venesection Tray

2 pair artery snaps.
2 pair tissue forceps.
1 pair stitch scissors.
1 pair small curved scissors.
2 small knives.
1 probe-pointed grooved director.
1 hook.
1 probe-pointed aspirating needle.
2 aneurysm needles.

In test-tubes add—

2 aspirating needles.
Horse hair and needles.
Silk-worm and needles.
White silk and needles.
Catgut No. 0 and needles.
Pipets.

Also add to tray—

Sterile towels.
Sterile brushes.
Sterile cotton.
2 medicine-glasses.
Camels' hair-brushes.
Bandages, all sizes.

Dressing Tray

1 curved artery snap.
2 straight artery snaps (1 with teeth, 1 without teeth).
1 plain tissue forceps.
1 tissue forceps with teeth.
1 grooved director.
2 probes.
1 small retractor.
1 sharp retractor.
1 curet.
1 curved scissors.
1 stitch scissors.
1 dressing scissors.

Outfit for Cystoscopic Examination

2 soft-rubber catheters, Nos. 14 and 16.
2 sterile medicine-glasses.
2 bottles of glycerin.
2 kidney basins.
1 medium urethral syringe.
1 large irrigating syringe.
1 large sub Q syringe.
Sterile cotton.
4 sterile bottles marked "R" (right).
4 sterile bottles marked "L" (left).

PREPARATION OF THE OPERATING-ROOM

There are three large pitchers for sterile water and one quart pitcher for measuring bichlorid, also a small pitcher for making normal salt solution out of the saturated solution.

A bundle of basins is then brought in, containing eight large basins and one small one. The large basins are 15 inches across the top and 6 inches deep. Large basins are used for hand solutions. Small basins are put on sponge nurse's table, to be filled with salt solution for dipping sponges.

There is an arm plunger 20 inches deep, 6 inches across the bottom, and 8 inches across the top, for operators and nurses to complete sterilization of arms and hands. Sometimes this plunger is attached to a revolving stand containing also solution basins.

There are two percolators, to be filled with any irrigating solutions designated by the operator.

Two or three large buckets, one for underneath the operating-table and others at convenient points, for throwing used linen or material.

Shelf Stand and Other Furniture

The *first shelf* on the stand contains the following:

Lysol. Alcohol in bichlor. Phenol, 86.4 per cent. Glass catheters. Olive oil. Glycerin. Viaform. Iodoform. Iodoform selvedged. Pulled iodoform. Plain and pulled white gauze. Alcohol. Ether.

Second Shelf.—Tr. iodin. Collodion. Sal. salt sol. Special bottles. Silkworm-gut. Gloves all sizes.

Third Shelf.—Hypodermic tray. Camels' hair-brushes. Safety-pins. Sealing gauze. Vaselin. Iodo. vasel. Suture tray. Dusting-powders, all kinds. Forceps. Politzer bag. Thiersch sol. Bichlor. sol. Boric. S. S.

Fourth Shelf.—Transfusing needles and tubing. Green soap. Medicine-glasses. Glass syringe. Rubber tubing. Brushes. Enema points. Connecting points. Irrigating points. Angle tubes.

Two hypodermics are put on the hypodermic tray and filled, one with strychnin and one with brandy, before each operation in case of emergency.

There must be a sponge-rack made to conform to the method of sponge counting, whatever that method may be.

The instrument tray stand.

The drum stands with full laparotomy drums.

The anesthetic stool.

The anesthetic table containing: Roll of gauze (4 inches) sewed with black thread; mouth-gag; tongue-forceps; small basin; ether or chloroform in the original cans, sealed; ether mask; safety-pins and towel; gas mask and gas machine if gas-oxygen is given; oxygen can with mouth-piece if gas is not given.

A 2-liter flask of salt solution, Locke or Ringer, as preferred by the surgeon, is kept sterile at a temperature of 120° F., ready for immediate use.

One small funnel 3 inches in diameter at the top, which is used in case salt solution irrigation is to be poured directly into the abdomen.

Transfusion tray is kept in the operating-room.

Mouth-cloths, head-cloths, and rubber aprons for operator and his assistants, including nurses who must come into the atmospheric field of operation.

PREPARATION OF THE PATIENT

Have ready—

For Vaginal Scrubbing.—Eight-inch clamp; retractor; scrub basin; gloves (scrub, 1 large); gauze, 2 pieces (1 small); bottle of sterile soap; irrigating tubing.

For Abdominal Scrubbing.—Scrub basin minus instruments and tubing; toothpick swabs; alcohol and ether sponges; bichlorid towel; gloves; gauze.

The area of operation is shaved and scrubbed with green soap and sterile water and cleansed with alcohol and ether. Some surgeons follow with a wet bichlorid towel; others paint the area with tincture of iodin and cover with a dry sterile towel. This latter part of the preparation is a matter of preference on the part of the operator.

Some surgeons prepare all patients the night before by scrubbing with green soap and water and with ether and alcohol washing, followed by bichlorid wet-dressing, left on until time of operation, when the usual preparatory room technic is employed.

All patients' feet are tied to the table with broad bandages with padded leather ankle cuffs, except in rectal or vaginal operations, one foot to each side of the table. Patient's hands are tied with arms straight to sides, with wrist straps that are tied to each other under the back, the straps just sufficiently tight to hold the arms close to the sides to prevent them from falling off the table, but so that neither hands nor arms are under the patient. For breast and neck operations hands are held by assistants and are not tied. In all rectal and vaginal operations the legs are held by assistants. In most up-to-date hospitals straps are obsolete, excepting in the preparatory room, before the anesthetic is started, when stirrups and straps may be used to save assistants.

Only for laparotomies are the hands tied above the head.

Never tie a patient's hands until the anesthetic is started, and the nurse should never leave patient while anesthetic is being given.

Position on Table

Laparotomy or Dorsal.—That in which the patient lies on the back.

Knee-elbow.—One in which the patient lies upon the knees and elbows, with the head upon the hands.

Knee-chest or Genupectoral.—That in which the patient rests upon the knees and chest, with the arms crossed above the head.

Lithotomy.—One in which the patient lies on the back with the legs and thighs flexed and the knees wide apart.

Sims.—One in which the patient lies on the left side with the right thigh and knee drawn up and the left arm placed along the back.

Cunningham.—Position for kidney work.

Trendelenburg.—For gynecologic patients. The patient lies on back with head and foot of table dropped.

Preparatory Asepsis

Scrubbing Up.—Hands are scrubbed with sterile brush and soap for five minutes, then nail-file and scissors are used; Schleich or sandsoap is then used with gauze for ten minutes, scrubbing arms above elbows. This is followed by hand solutions, alcohol, 60 per cent., bichlorid, 1:6000 (this in plunger), then followed by sterile water. The whole procedure takes at least twenty minutes.

Surgeons put on clean undershirt, operating-room trousers, rubber apron, head-cloth, and mouth-piece, with sterile operating-room gown over all. The gloves are helped on by the nurses.

Instrument nurse has on sterile gown, sterile gloves, mouth-piece, and head-piece; likewise the sponge nurse. The supe nurse is not supposed to be clean.

Operator and his assistants are sterile, but anesthetist is not.

RULES FOR NURSES

Instrument tray, after being made for specified operation, is put in to boil for half an hour before the operation.

When a drum or binder package has been opened for an operation, the material must never be used again until recounted and resterilized as originally done.

No ligatures, sutures, tendon, or other material that has once been exposed in an operation shall be used again until sterilized all over.

All tubing and sutures are treated in 95 per cent. carbolic acid for ten minutes.

Never force an instrument together. If it does not go together easily there is something wrong.

Oil the joints of all the instruments with alboline each time they are used before sterilizing.

Dry all needles (transfusing), trocars, and snares with compressed air (Politzer bag).

In case an instrument falls on the floor, always boil for ten minutes before using—never sterilize in carbolic and alcohol.

Count sixty before removing an instrument or suture from carbolic into alcohol. Disconnect instruments before putting into carbolic.

The Operation.—At the time of operation the sponge nurse counts every bundle of sponges as she opens them.

Used sponges are picked up by the supe nurse and hung on the rack for that purpose, which contains 10 hooks on each side for convenience in counting. Before the peritoneum is closed the sponge nurse and instrument nurse count the sponges and instruments, and report to the surgeon whether all are there.

Sponges from clean operations are saved, washed, boiled for one hour, dried, and folded. From pus cases they are burned.

THE PREPARATION OF CATGUT

With the uses of catgut the hospital administrator has nothing to do; that is the province of the surgeon; but the suture material has been so efficiently developed in the past decade that it now is standardized and classified, and it has attained such constant units of tensile strength, and such precisely regulated time of absorption, that the busy surgeon has been able to practically waive his former duty of superintending the details of its preparation, and may to a large extent content himself with knowing definitely the care bestowed upon this important factor in his success, or, better still, the source of the product.

Most modern hospitals in which a considerable amount of surgery is done have given over the home preparation of catgut, and buy their supply from recognized experts in that business. There are many reasons for this: on the score of reliability there can hardly be a doubt that a scientifically inspired commercial house, whose chief asset is public confidence, will use every expedient to maintain and even improve its product in accord with scientific principles; whereas, the home-prepared article must constantly be subjected to the hazards of handling by uninformed nurses, who are frequently changed from post to post, further complicated by the necessarily unsystematic procedures and conditions in the preparation rooms concerning a matter outside the routine of hospital practice; nor will it be possible ever to guarantee precisely the same conditions for any two days or any two batches of gut in the hospital; so even if the utmost care and conscientiousness be admitted, without the advent of a single unguarded movement, there will be a difference now and again in the time of absorption of the gut, a matter of the most vital concern to the surgeon who has predicated his whole operation upon the sequel of events in the healing of the tissues and the absorption of the suture material and its consequent non-irritating effects.

If it be on the score of economy—the inexpensiveness of the home-prepared article, as compared with the apparently high-priced purchased product—the advantage is apparent rather than real. As a matter of fact, surgeons know hospital conditions pretty well, and the unpreparedness of the institution in the matter of carefully measured processes required in the preparation of gut, and they are becoming more and more reluctant to hazard their success upon the unskilful work of hospital people in the performance of a duty that must be, after all, only a very small part of the day's employment, and they will not take their important patients where they must use such material.

In the free wards of the institution, and in the surgical rooms of the charity hospital, there is another factor at work, even if the welfare of the patient and his safe recovery be not the first consideration—and that is, delayed convalescence in the event of catgut infection or irritations due to improperly prepared gut, which amounts almost to the same thing, because irritation stimulates an exosmosis of serum about a wound, and this in turn forms an almost perfect culture-medium for those micro-organisms always present more or less in the tissues, and which, under proper conditions, eventuate in pus formation. It costs money to keep a patient in the hospital, and, whatever may be the attitude of the institution on the point of keeping a pay patient as long as possible, it will not take very long for a free patient to consume in food and dressings whatever difference there may have been between the purchased and the home-prepared article. Moreover, it frequently happens that a whole batch of catgut is either spoiled in the process of preparation in the hospital, or else is found to be unsterile upon culture tests and must be discarded, which would also tend to indicate the danger of the whole system, or fre-

quently the tensile strength is found to be so poor at the operating-table that strand after strand breaks, which has the disadvantage of trying the surgeon's nerves, in addition to the loss of the material.

So that, by either horn of the dilemma, the home preparation of catgut is not as inexpensive a proposition financially as it appears *prima facie*, and a careful analysis calls for the conclusion that "home-made" catgut does not represent surgical economy.

Now let us discuss the physics of catgut preparation as it is conducted by experts:

The first question naturally is, how can catgut be rendered perfectly sterile without affecting its integrity for the uses to which it is to be put? The methods by which catgut can be prepared are divided into two general classes—first is the heat method, and second, the chemical process.

Of the chemicals used in catgut preparation iodin seems at the present time to be the most popular; biniodid and bichlorid of mercury are also used to some extent. The chief objection to the chemical method of catgut preparation is that the chemicals produce an antiseptic material, and the obvious drawback lies in the fact that in burying the catgut the surgeon introduces a certain amount of the chemical; or, in other words, the tissues must take care, not only of the catgut itself, but also of the antiseptic. It seems only reasonable to assume that whatever antiseptic is powerful enough to destroy bacteria will also be powerful enough to destroy leukocytes, the great repair agents upon which the surgeon must rely.

The second serious objection to chemic methods of preparing catgut is the fact that the chemicals do not seem to completely penetrate the strand; this may readily be demonstrated by taking, for instance, a piece of iodin catgut and stripping it, which will show that the inside is yellow instead of the reddish-brown color apparent on the surface of the strand; the natural color of the iodin tincture is reddish brown, and, since the inside of a piece of iodin catgut is found to be yellow, it seems apparent that the sterilizing agent has not come in contact with every part of the strand in any considerable strength. Consequently, although the chemical used may have sterilized the outside, the "core" is in the same bacteriologic condition that it was before the immersion of the gut in the antiseptic.

This fact has been demonstrated in the Michael Reese Laboratory in the following manner: two strands of iodin gut were taken from a batch, some of the strands of which had given rise to slight infections—one of the strands, picked under carefully sterile conditions, was embedded in culture medium; the other strand, handled also under careful technic, was cut into ¼-inch sections and embedded in another test-tube of the same medium. After fourteen days no growths had occurred in the case of the full-length strand, but healthy growths were present in the tube containing the sectioned gut. This procedure was repeated five times to avoid technical errors, but the results were the same each time. It was deduced that the gelatinous coat of the whole strand had prevented the escape of the micro-organisms, but the cut ends of the sectioned gut had permitted the escape and subsequent activities of the bacteria. There is scarcely a doubt that persistence to the point of solution of the undivided strand would have led to bacterial growths there also.

Still another objection to iodin catgut is that the iodin has a rotting effect upon the animal tissue, and the longer the gut is left in it or the greater the strength of the tincture, the more marked is the rotting action of the iodin. It may be well to mention here that catgut, purposely left in iodin for a long time, was found to have

lost its tensile strength, and, therefore, could not be used for surgical purposes, and even then the "core" of the strand stripped a clear yellowish color.

With bichlorid of mercury, one must bear in mind that the action of this on albumin or gelatin is to form an insoluble albuminate of mercury; the nature of catgut being gelatinous, the action of the bichlorid would be to form an impenetrable albuminate; in other words, the action of the antiseptic would be to defeat the very object intended.

Home-made catgut is prepared in some hospitals by the so-called Claudius method, which calls for the immersion of the gut in a 1 per cent. tincture of iodin in alcohol, in which the material is supposed to be stored for eight days. Several modifications of this method have been suggested—some vary the time, generally by reducing the number of days (to minimize the rotting effect of the solution), while others vary the strength of the tincture. Some prefer an aqueous solution of iodin instead of the alcoholic tincture recommended by Claudius.

Water seems to be the only liquid which has the property of penetrating a strand of catgut through and through, but, unfortunately, water cannot be used to sterilize catgut, on account of its liquefying action upon the animal tissues. Alcohol, chloroform, and ether are other liquids that seem not to completely penetrate catgut.

There is, however, one method of catgut preparation which calls for the boiling of catgut in water for a short length of time; to comply with it, the catgut must be previously hardened by means of formalin, to guard against the softening action of boiling water—but, even then, the No. 1 can be boiled only from seven to nine minutes, and the smaller sizes for even a shorter time than this. In view of the fact that bacteriologists maintain the minimum thermal death-point of tetanus spores to be twenty minutes of wet heat at 212° F., it is at once apparent that by this method it is physically impossible to destroy all bacterial organisms. In other words, the surgeon who has his catgut prepared by this method allows his instruments to receive more sterilization than his catgut, which is not consistent, because with catgut the inside as well as the outside must be rendered sterile, whereas, with the instrument, it is merely a matter of surface sterilization, and, above all, the catgut is to buried in the tissues, which is not the case with the instruments. Incidentally, another serious drawback to this method is the mummifying of the animal tissue by the action of the formalin, tending to produce a brittle material.

Since, then, neither the chemic nor the wet-heat method is ideal as well as practicable, let us now consider the only other procedure which remains open—that is, the use of dry heat.

Since organisms that may be destroyed at a certain temperature in wet heat are not destroyed at the same temperature in dry heat, it is obvious that the temperature must be raised and maintained for a greater length of time than would be the case with wet heat; and again, authorities have found that several applications of dry heat (fractional sterilization) are more destructive to bacteria than only one prolonged application. Dry heat, moreover, not only goes to the core of the strand, but an aseptic, non-irritant material is produced, for there is no chemical to injure the tissues. It is claimed that, while the staphylococcus is destroyed in wet heat at 180° F. in a few minutes, it requires sixty minutes in dry heat at the same temperature (Lehmann). With the tetanus spore the established thermal death-point is considered 302° F. for an hour in dry heat (Rosenau, Park, and others); it has also been found that this organism will resist 284° F. for as long as three hours (Sternberg).

Of course, the possibility of anthrax in catgut is well known as it is a sheep

disease, and it is possible for spores to be present in the intestines. Tetanus being a soil disease, the sheep is quite likely to act as a host to the spore of this bacillus. It is by no means a common thing to find either of these spores in raw catgut even before any sterilization is attempted, which is a fortunate thing for those who use indifferently prepared catgut. The surgical world should be grateful that tetanus or anthrax infections are rare with any kind of catgut, but there is a danger, and the conscientious surgeon and hospital administrator must take steps to eliminate the possibility.

Commercial raw catgut is surprisingly clean, even before sterilization, and so long as the catgut preparer deals with clean catgut—so far as pathogenic bacteria are concerned—immersions in alcohol, ether, chloroform, or iodin will produce excellent results; but this clean catgut really would not need any sterilization at all, or, to put it more clearly, if we could select the pathogenically clean raw catgut and use it as it is, the chances for infection would be very small.

The worst result that might follow its use would be an irritation, perhaps, from the non-pathogenic bacteria present in it, and such irritation the surgeon might attribute to some cause other than the catgut.

The following methods of sterilization by dry heat are used to some extent:

The strand of catgut is placed in a paraffin-paper envelope, placed in an oven and subjected for three hours to a temperature of about 250° F., after which the material is ready for use. There are objections to this method: first, the material has not been subjected to a temperature considered by authorities to be the thermal death-point of tetanus and anthrax spores. Sternberg has found that tetanus spores resist 284° F. for three hours, as mentioned above, while this method calls for only 250° F. for the same length of time; second, by this method the material receives only one application of heat, whereas it seems to be acknowledged that three fractional applications of heat are necessary, and it is significant that most hospitals sterilize their dressings by means of three fractional applications.

Another method in use in some hospitals consists in boiling catgut in alcohol, the length of time and temperature varying with the individual operating-room nurse's "technic"; some nurses boil catgut in alcohol without pressure for an hour; the boiling-point of alcohol is 170° F. Occasionally the time is raised to as much as two hours or even three hours. A great many, however, subject the alcohol to pressure in a steam sterilizer, and run the temperature as high as 225° and even 250° F.; when the alcohol is subjected to pressure in this way, the length of time is generally not more than an hour, or even, in some institutions, less.

In considering the efficiency of this method it is necessary to draw a line between wet liquids and dry liquids, because this is of the utmost importance bacteriologically. Water is a wet liquid—any liquid containing water is a wet liquid; liquids containing no water are dry. Commercial absolute alcohol (95 per cent.) does not contain a sufficient quantity of moisture to gelatinize catgut boiled in it, and it is a dry liquid. It is physically impossible to boil catgut in water or anything containing as much as 15 per cent. or more of water, because the water in a very short time softens and gelatinizes the animal tissue; therefore, it is absolutely necessary to boil catgut in a liquid containing no water, otherwise the gut will be softened and, therefore, rendered useless.

Now, then, with alcohol we have a dry heat of 170° F. (the boiling-point of alcohol) compared with 302° F., or, if boiled under pressure, the maximum temperature obtainable with alcohol is 250° F.; 170° F. does not compare very favorably with 180° F., the thermal death-point of staphylococcus (Lehmann), and certainly neither 170° nor 250° F. with dry heat are sufficient to destroy tetanus spores in the

time usually allowed by hospitals that prepare their own catgut. It is evident, therefore, that the alcohol methods are not safe from the bacteriologic standpoint, measured by recognized bacteriologic authorities.

There are a number of concerns that have the confidence of the medical profession in the preparation of catgut. One of these is Van Horn and Sawtell, a firm that has many adherents, and whose catgut products are regarded as standard by a large section of the profession. The Michael Reese Hospital employs the catgut of this firm exclusively, and we are, therefore, taking the liberty of accepting its methods of catgut sterilization as illustrative of the expert preparation of efficient catgut.

After the necessary pre-preparation of the gut the strand is rolled up and placed in a previously sterilized tube, one end of which is sealed and the other left open; in this way reinfection of the gut, due to its being touched by human hands, is impossible after the process commences. In the oven it receives an application of dry heat for a period of four and one-half hours, the temperature gradually reaching a maximum of 240° F., and cumol, one of the benzine series (used because it allows of a high temperature and does not soften the catgut), is placed in the tubes with the catgut and also surrounding the tubes. From 240° F. the temperature is gradually raised to not less than 310° F., at which minimum it is kept for two hours. On the following day the cumol is poured off, and another application of 240° F. for an hour is made; this application not only forms the third fraction of the process, but evaporates the cumol from the surface of the strand. Then the preserving fluid is placed in the tube with the strand under aseptic precautions, after which the tube is sealed.

On the following, or fourth day, to guard against any possible air contamination which may have taken place during the filling of the tube with the preserving fluid in spite of the precautions, the sealed tube is placed in the steam-pressure sterilizer and subjected under pressure to 270°; F. for one hour, and this is repeated on the fifth day, thus making five fractional sterilizations, three of which take place before the sealing of the tube and the concluding two after the sealing.

Kangaroo tendons are taken from the tail of the kangaroo, and, after the necessary cleansing preparation, are sterilized in precisely the same way as catgut.

Chromicized catgut is made by treating catgut with chromic acid for varying periods in proportion to the time it is intended to resist absorption in the tissues. It is obtainable in resistances of ten, twenty, thirty, and forty days, referring to the length of time the catgut can be depended upon as a suture—in muscle tissue before absorption begins. After the catgut has been treated in chromic acid for the proper length of time the acid is eliminated, and the sterilization proceeds by the fractional method described above.

RUBBER GLOVES

Gloves are so essentially appurtenances of the operating- and dressing-rooms that we shall be justified in considering them apart from the other rubber goods of the institution.

There is no concensus of opinion as to just how far rubber gloves should be used in institutions. There are many hospitals that do not offer their surgeons, obstetricians, and gynecologists rubber gloves, and some institutions require operators to furnish their own gloves when they wish to wear them, and there is rather a disposition everywhere to make operators furnish their own gloves, not because institutions regard gloves as a luxury, but rather because operators are prone to go just

one step farther than most administrative officers feel justified in following; that is, if the institution begins to furnish gloves and to mend those that are pricked with a needle or very slightly torn, the operators are likely to offer the objection that infectious matter may catch at the point of the mend, and, therefore, they ask for new gloves for every operative procedure. Also, nowadays many operators go to the extent of demanding clean, new gloves for every one of a series of clean operations and for each dressing. Other operators require not only their first assistants, but all the nurses engaged in the operating-room to wear new, sterile gloves.

It seems a good deal of this glove technic borders closely upon faddism; a sterile glove should be a sterile glove, whether it is brand new or has a mend in it; if the glove is not sterile, the mend will not be sterile, and if it is sterile, then the mend is sure to be also sterile, and usually the point of a mend in a glove is stronger than any other part, so far as its likelihood to break is concerned. It is an illuminating fact that surgeons who must buy their own gloves do not carry their demands very far into faddism, and can usually get along with far fewer gloves than those to whom the institution supplies them.

Then there is the question of the lightness or heaviness, smoothness or roughness of gloves, the length of the gauntlet, the reinforcement and taper of the fingers. Choice in all these particulars is individual to the operator; some operators, for instance, require pebbled gloves of the thinnest kind for laparotomies, whereas they will require a smooth glove for superficial operations, and vice versa. Some operators require that all finger-tips be reinforced and shaped to the nail, whereas others insist on the very thinnest sort of finger-tips; most operators who do deep surgery require gauntlet gloves; some surgeons require in all their work a very heavy loose fitting glove, such as that commonly used in postmortem work, where the deftness of finger is not of prime consideration.

It is not at all certain that any institution, however rich and liberal, should be asked to furnish all these various sorts of gloves for its attending operators. In a certain institution, where there are perhaps fifty or more operators at various times in a large or small way, it is the rule to furnish each operator with whatever kind of gloves he requires, and for that purpose an infinite variety of gloves, as to form, size, texture, and make, are kept on hand, and there is an immense waste in this procedure, because rubber gloves oxidize and vulcanize very easily, and cannot be kept intact and in serviceable form longer than a few weeks at most, and when they undergo this degeneration they are, of course, worthless, as they tear on the slightest attempt to put them on. In this institution the glove bill alone amounts to $2000 to $2500 per year.

The Test of Gloves.—It goes without saying that gloves must be fresh and comparatively new, and of the purest rubber, if they are to be useable and capable of sterilization. There are many salesmen who sell gloves to hospitals, or attempt to do so, but most of these people are mere hucksters, and there are only three or four firms that make gloves worthy the name and whose goods are to be relied upon, and then only providing they themselves offer them first hand and under the name of "firsts." The Canton Rubber Co., Faultless Rubber Co., and Miller Rubber Co. are practically the only makers of rubber gloves that are worth buying.

There are only two tests for gloves that amount to anything—one of them is to blow the glove up until it is as thin as tissue paper, and then go over it critically with the eye and finger to detect weak spots either in the finger-ends or elsewhere. There are sometimes blebs or blisters in the glove, but the usual defects are in or between the fingers. After the glove is well blown up it should bear a considerable amount of pressure as the hand goes over it trying out the various parts. If the glove

has undergone deterioration, due to oxygen in the atmosphere, such as will invariably occur in the shop-worn gloves, where will appear sometimes distinct cracks, especially at the finger-ends, but more generally this deterioration will be manifest in lighter colored specks in the glove, and these light spots are always weak; these spots show clearest when the glove is relaxed and not blown up.

The other test for gloves is hot water blown into the glove under pressure with a syringe; this will invariably reveal even the most infinitesimal needle prick. The heat from the inside will dry any water that may be on the outside, and if some pressure—as for instance, from a bulb syringe—has been used in filling the glove a wet spot will appear wherever there is the smallest hole; and, by the way, this is the best of all methods of detecting flaws in gloves after they have been first used and before they are resterilized. In a good many institutions the nurses test their clean gloves by blowing them up, covering them with powder, and holding every part in turn to the cheek, but it goes without saying that this method is defective and open to many errors.

Sterilization of Gloves.—In some institutions gloves are sterilized by boiling alone. Of course this method is plainly defective in two directions: first, boiling water has a temperature of only 212° F., which will not destroy a number of pathogenic micro-organisms, especially the spore formers; and, secondly, because boiling water destroys the rubber very rapidly. Some institutions again sterilize in live steam under a pressure of 15 pounds, and a good many of the sterilizer manufacturers advocate this method; it is certainly the best way if the life of the glove alone is under consideration, as gloves can be resterilized as many as six or eight times if vapor sterilization is employed, but it is not effective even at a pressure of 15 pounds to the square inch, or 250° F. for thirty minutes, because gloves heated in this way, and then planted in one or other of the culture-media, have shown vigorous growths of micro-organisms. In the Michael Reese Hospital the following method is employed:

The gloves are first washed clean in hot water; they are then wrapped in cloths and put in the sterilizer, and kept under live steam at 250° F. for thirty minutes. The vapor is then withdrawn, and a dry heat of the same temperature is introduced for thirty minutes longer. This last half-hour is hard on the glove, but no culture has ever been formed following it, and will not be, unless there is some defect in the technic of getting the glove from the sterilizer to the culture-medium.

"First" and "Second" Gloves.—There seems to be a good deal of high finance in the sale of rubber gloves by the manufacturers. Most makers sell their "firsts" or "prime" gloves at prices varying from $5.50 per dozen pairs for the smaller smooth gloves, to $7.50 for the larger size smooth and rough gloves, with an extra price for gauntlets and for fads of individual operators, but the market for these gloves is somewhat limited, and it is the custom of manufacturers to sell their surplus as "seconds." These "seconds" are admittedly defective, but sometimes these defects cannot be pointed out even by the manufacturers themselves. Sometimes these gloves not only show no defects, but stand all the tests as to freshness and first-class quality, and should be sold as "surplus" instead of "seconds"; at least the plea of "defective" gives the manufacturers warrant to let the gloves go at a lower price than "firsts" are held at. However, glove buyers should make themselves so thoroughly acquainted with all the tricks in the glove business as to be able to buy their gloves independently of whatever the manufacturers may say or offer. If "seconds" that are really as good as "firsts" can be purchased a saving of 50 per cent. can be made. Sometimes a manufacturer, in offering "seconds" that appear to be "firsts," will hint that perhaps the "seconds" will not bear resterilization as

many times as the "firsts," but this statement does not work out in practice, as it is the experience of a good many of us that a good glove, whatever it may be called as to quality, will wear about as well, will stand pricks as poorly, and will sterilize as frequently as any other good glove.

THE SURGICAL ANESTHETIC

The subject of anesthetics for the operating department must be considered from the standpoint of the surgeon and from that of the hospital administrator. However, since both have the same ultimate purpose in view, we shall endeavor to analyze and correlate the two sides of the problem.

The first and most vital question to be answered is this: Into whose hands shall the actual administration of the anesthetic be entrusted? Hitherto the custom in many hospitals has been to detail the house physicians as anesthetists, allowing them to become proficient in that best of schools, experience, under the guidance of skilled tutors. In some private hospitals each operator has his own paid anesthetist; in a few there is a salaried expert anesthetist for all cases, and in others an expert available for special cases.

There is a tendency, manifest with many surgeons, to employ specially trained young women to administer their anesthetics, but, since it is not proposed that these operators shall have had a competent medical education, their employment as a solution of the problem is hardly worth considering, because, while a person trained by thumb-rule may administer in the classical, average operation, the great majority of patients will fall outside the class of ordinary, and the conduct of the anesthetic must meet the requirements of the individual and not the class. No two cases of pneumonia can be treated precisely alike, even though both may run a normal course, nor can any two sick people ever be treated exactly alike. There are radical differences between individuals—no two will have the same receptiveness to certain drugs, and in the same way, and perhaps for the same physiologic reasons, no two persons will take any anesthetic exactly alike. There are some medical men, even able surgeons, who think all the requirements have been met if the patient is kept relaxed and noiselessly asleep during the operation and is put back to bed alive. This philosophic attitude will hardly do to-day, when the surgeon is undertaking surgical operations that call for the severest tests upon the reserve forces of sick people, when a feather-weight of difference may mean life or death. What a huge percentage of patients operated upon die nowadays from postoperative complications—pneumonias, uremias, shock, and infections—that just a little more resistance might have enabled them to weather!

Then how important is it to bring the patient through the operation in the best possible shape, and with the greatest possible amount of reserve force for the long days and nights of hazardous convalescence!

It will not do any longer to order any particular anesthetic for any given case before the patient goes to the operating-room. Preparations must be made for an instant change from gas to ether and the reverse. The anesthetist must realize, from second to second, any adverse effect of the drug upon the patient, even to the finest shade, and must be ready to shift his mask before another breath is drawn. How negligent, even criminal, it is to subject a patient to the mercies of a person unversed in the sign and symptom language of unconsciousness. It is for these reasons that anesthetics must be given by trained, experienced medical persons, into whose hands even then will come enough untoward results to make it imperative that only the most competent should be employed.

In the Michael Reese Hospital there is an anesthetic staff of three physicians, former interns, two of whom are on service simultaneously, and whose duty it is to teach all new interns the Michael Reese methods of administration, remaining with each new man until they can certify him as experienced or shift him as impossible. They are also present for any particularly difficult case, ward or private.

In cases of special hazard, or at the request of the operator, the expert attending anesthetist himself must give the anesthetic, receiving remuneration therefor. This arrangement places the responsibility on the shoulders of experienced men, and results in a much better average of anesthetics, and breeds a sense of security during the operation, a feeling most operators will appreciate.

The purpose of the anesthetic is to keep the patient in a state of unconsciousness, with relaxation, during the surgical operation, and to bring him out of the operation with the least possible damage, both as concerns the effect of the anesthetic itself and the surgical insult to the system. To achieve this double purpose many of the best minds in the surgical world and great numbers of able laboratory men have spent vast energy and deep investigation. We shall omit discussion of those methods which are still on trial, and content ourselves rather with a view of those anesthetics that are recognized and approved by the medical profession.

There are only three of these anesthetics—ether, nitrous oxid with oxygen, and chloroform.

Chloroform.—Chloroform is quickly disposed of. In this country and in the best clinics abroad, notably Von Eiselsberg in Vienna and Bumm in Berlin, it has been discarded almost entirely. Its use should be restricted to those few cases in which ether is contra-indicated, and even here it is in large part being supplanted by nitrous oxid-oxygen. Some few men still persist in its use, but there is no doubt that its extremely narrow margin of safety renders it dangerous in the hands of the average anesthetist, and, although statistics are most unreliable, all are agreed in assigning the highest mortality to chloroform. Moreover, the recent work of Henderson, to be referred to later, helps to explain its dangerous properties. When used at all, it must, of course, be given dropwise on the open mask, always remaining below a vapor concentration of 2 per cent. A chloroform anesthetic may be switched to ether with comparative impunity, but the reverse procedure, unless interrupted by several moments of air breathing, may result in disaster. Finally, the immunity to chloroform, supposedly possessed by women in labor, remains debatable, and here, also, chloroform is beginning to be displaced.

Ether.—Ether has been the anesthetic of choice up to the present time, and rightly so, when its striking advantages are taken into consideration; chief among these is its wide margin of safety in the hands of the average house physician after complete relaxation is achieved. It affords complete relaxation, with safety, in a group of cases in which nitrous oxid-oxygen occasionally fails—*i. e.*, perineal and pelvic surgery and surgery about the diaphragm. Itself a stimulant of the respiratory and vasopressor centers, it is least often followed by shock when properly administered. It is safest in arteriosclerotic and in organic heart lesions.

When preceded by nitrous oxid, ether loses its chief terror to the patient—the relatively long period of discomfort before unconsciousness is attained. It is unsuited in all cases of respiratory and renal disease. The method of administration of choice is the open mask drop method, preceded in the modern hospitals in all cases, except children, by nitrous oxid to obtain unconsciousness quickly and without discomfort.

In alcoholics a concentrated vapor is attained by adding folded towels, which are removed as soon as may be.

Nitrous Oxid-oxygen.—Nitrous oxid-oxygen has rapidly won favor in some of the best hospitals. It has undoubted advantages over ether as a general anesthetic, the most vital of these being its transitory effect on the organism. Nausea and vomiting are practically eliminated, being reduced to 2 per cent. of cases, and careful investigations have revealed no changes in the blood and none in the urine. It is much more desirable in all respiratory and renal diseases, eliminating almost entirely the dangers of uremia, acute bronchitis, and similar sequelæ.

The mortality with this anesthetic is lowest of all the general anesthesias—always bearing in mind these facts: that it is contra-indicated in organic heart disease and arteriosclerosis, since it causes an increased blood-pressure, and an overdose of nitrous oxid results in tonic and clonic muscular contractions, which may send the blood-pressure to a disastrous point, and it is the most difficult of all general anesthetics to administer because of the extremely narrow margin of safety between consciousness, complete unconsciousness, and an overdose, with symptoms of nitrous-oxid poisoning. Finally, the expense, which will be detailed later, is a very important item in the hospital administration.

Combined Ether-nitrous-oxid-oxygen.—The combined method, already mentioned, may be carried to a point of high efficiency, and some of the best anesthetists are accustomed to nurse dangerous risks along, starting with nitrous oxid-oxygen, switching to ether if the patient does poorly or refuses to relax properly, and then going back to gas again as soon as relaxation is attained; occasionally this switching will be made two or three times in the course of an operation, and a patient believed to be all but inoperable will be worried through some desperate operation in this way with little or no anesthetic risk and insult.

Gas anesthesia is not generally well understood, and it may safely be said that many of the mishaps that have occurred with the use of gas were due to inexperience on the part of the anesthetist.

In the Michael Reese Hospital continuous nitrous oxid-oxygen is used in about 50 per cent. of all the anesthesias, and it is used in any procedure, from a mere whiff for examination in the anesthetizing room to a case that will last for two or three hours, as witness the record of the continuous use of gas-oxygen for three hours and forty-five minutes, with recovery, in a case of universally adherent multilocular ovarian cyst, where the various points of the tumor had to be dissected out of the abdominal cavity, and its use continuously for an hour or more is of daily occurrence.

There are two recognized forms of apparatus for the use of gas-oxygen. One is the design of Dr. Teter, of Cleveland; an excellent apparatus, if somewhat complicated; and the other is the one designed in the Michael Reese Hospital, a much simpler device. This apparatus is illustrated in the sections on Equipment of the Operating-rooms.

Within the past year a new design of gas-oxygen apparatus has been placed on the market; the cylinders are mounted on wheels, and the oxygen tank holds 750 gallons, while the gas tank holds 1250 gallons. The chief advantage of this larger equipment is that no change of cylinders need occur in the course of the operation and there is no freezing of the gas to delay or annoy the anesthetist; its chief disadvantage is a somewhat more complicated arrangement of valves, which, unless carefully watched, will cause a waste of gas by leakage. In the Michael Reese Hospital the old apparatus is set upon the platform of the new carriage, and we have then the advantage of the larger cylinders.

Although in the physical laboratory, under controllable conditions of pressure

and temperature, these two gases can be mixed on a percentage basis, in the operating-room no such attempt can be made, the quantity of oxygen being continually altered to suit the condition of the patient. The mask is the ordinary mask supplied by the S. S. White Dental Manufacturing Co. under patents, and the Teter Co.'s gas bags are the best that are made. They are of pure rubber and protected by a net that prevents, at least to a certain degree, undue expansion. The usual procedure in gas administration is to administer the nitrous oxid pure at the start, and carry it to a point where the patient begins to show asphyxiation, as expressed in the beginning cyanosis of the face. Then a small flow of oxygen is added, which serves to clear the patient's face and skin and yet hold him unconscious and relaxed. This administration of gas and oxygen cannot be made by any set rule or on any percentage basis, the patient's condition being the only guide.

There is a very simple form of apparatus, made by most of the gas manufacturing concerns, that consists of a standard with a tank of gas on either side and a gas bag suspended from another point. A modification of this same apparatus consists in using a tank of gas on one side and oxygen on the other, the gases both going through the same bag. The principle of this bag is wrong, of course, as the bag must be emptied of gas before an unmixed oxygen can be had for the patient's revival if things do not go right, and the patient might die long before the bag had been emptied and the oxygen brought into use.

The Johns Hopkins Hospital has designed an apparatus employing the principle of rebreathing, by which the nitrous oxid is inhaled and exhaled and reinhaled a number of times. That institution claims great merit for the apparatus, but others who have tried it very carefully, and with every intent to succeed with its use, have been unable to do so. It is known that exhaled breath contains, besides carbon dioxid, definite if small quantities of toxic volatile substances, and it seems to those who have tried this rebreathing method that there is a profounder poisoning following it than with the direct use of fresh gas all the time, and the patients seem to have taken this profound poisoning back to their beds, and to have been some time recovering, whereas with fresh gas and without its re-use, but with the employment of carefully administered oxygen, the patient, even after a long operation of an hour or two, wakes up almost refreshed, and within a few respirations after the gas is discontinued and pure oxygen substituted the patient usually gets back to bed without any nausea and without any apparent exhaustion, and there seem to be no ill after-effects.

There is at present, however, thanks to the illuminating theories on acapnia and shock, as advanced by Professor Henderson, of Yale, considerable experimenting being done in the use of carbon dioxid during anesthesia, and especially in the nitrous oxid-oxygen method.

In the Michael Reese Hospital this newest adjunct, intended to serve as a weapon against shock, is employed in two ways—first, as pure carbon dioxid compressed and available at will, and, secondly, in combination with oxygen as an 8 per cent. admixture of carbon dioxid, these combined gases being used in the oxygen tanks instead of pure oxygen. This whole principle is yet in the experimental stage.

Choice of Anesthetic.—With most patients the surgeon himself will choose his anesthetic, in view of the patient's condition, as expressed in the physical examination of heart and lungs and the pathology of the case, and in the urine as indicative of the kidney condition. In the operating-rooms of the better hospitals the choice of the anesthetic seems to be a routine one, based on these findings, and the choice is usually made by the hospital interns along lines of policy established by the institution's surgical staff.

The Cost of Anesthetics.—In the administration of ether the personal equation is a very important factor. Some anesthetists can use an open mask, and yet keep a patient nicely asleep on an amount of ether that would make no impression on him at the hands of another anesthetist, whose method would result in the evaporation outward of a very much larger proportion of the anesthetic.

There is much to be said about the cost of ether. The Squibb's ether contains a small percentage, about 2 per cent., of alcohol, and its evaporation from the mask is very much less than it would be if the drug were pure.

The Malinckrodt ether has about the same quantity of alcohol, and experiments conducted in the laboratory of the Michael Reese Hospital indicate that under identical temperature conditions the two varieties, when exposed in identical calibrated glass receptacles with identical evaporating surfaces, have the same rate of evaporation; moreover, the quantity administered per hour per patient, when averaged over long periods, is about the same. The cost of the Malinckrodt ether is much less than that of Squibb's product. Most of the large institutions of the country use, indifferently, either Squibb's or Malinckrodt's ether, and with about the same results apparently, excepting in the matter of cost, which is in favor of the Malinckrodt.

The cost of gas-oxygen for anesthetic purposes is a very considerable item, either in the running expenses of the operating department or from the standpoint of the patient, if there is a charge made for the gas. Nitrous oxid costs from $1.25 to $2 for a 100-gallon tank, according to the amount purchased by the institution, and oxygen in the same compression tanks costs about the same for 40 gallons. A single tank of nitrous oxid of 100 gallons will last an average of about 25 minutes—that is, it will require two to two and one-half tanks to do an operation extending over one hour. Some patients require much less than this, while other patients, especially alcoholics, and those that have been accustomed to narcotic drugs, will require very much more, and the amount used will also depend a good deal on whether the gas must be used without any considerable mixture of oxygen, or whether a good deal of oxygen has to be used from time to time during the operation to avoid cyanosis. Taken on the average, from 200 to 250 gallons of gas and 40 to 50 gallons of oxygen per hour will be used. If the nitrous oxid is used rapidly during the anesthesia the tanks are likely to freeze at the valve, and must then be shut off until they thaw out again, and, where careless people handle the gas, a good deal of it is lost, because they neglect to use the balance of it after the valve thaws out, which occurs in a few minutes.

Although we have discussed, under the section on Records of Patients, the necessity of making urinalyses and of obtaining a permit for the operation, we may be pardoned for very briefly mentioning these two items of procedure again, especially the routine practice of never giving a general anesthetic to a patient without the report of the urinalysis being present in the operating-room for purposes of observation. It cannot be too strongly insisted upon. Where this is not practised many a patient has been put to sleep with ether whose urine examination showed a kidney condition that would absolutely prohibit that form of anesthesia, and, as a rule, the urinalysis will have a very large weight in the choice of the anesthetic to be used and the after-conduct of the anesthesia itself.

Rules for the Administration of Anesthetics

General Remarks.

While the operating surgeon cannot waive his responsibility for the proper conduct of the anesthetic, it should be the duty of the hospital administration to establish and carry out a routine, acceptable to the surgical staff, that will ensure a high order of service and reduce the danger of accident to the lowest possible point. We have discussed elsewhere the preliminary permit for the operation and the establishment of the patient's condition, as expressed in the urinalysis and blood-pressure, and of the duty of the operator or his medical associates to select the anesthetic to be given in all debatable cases. However, if rigid rules are enforced, based upon a broad experience, even these duties become negligible in a properly conducted hospital.

We have discussed elsewhere also the personnel of the anesthetic service; let us add only the suggestion, that oftentimes a very simple surgical procedure may take on extremely grave complications, chargeable directly to the anesthetic, and the most critical operations may go smoothly and terminate happily if the anesthetic is administered in a masterful and workmanlike manner.

The Anesthetist.

All human beings have their "off" days, and the giving of an anesthetic is a trying ordeal at best; consequently, no person should officiate unless he is mentally placid and calm and physically sound.

He should be personally clean, and not have come from the postmortem room, from a pus dressing, or from attendance on communicable disease, and especially erysipelas.

He should be free from ear, nose, throat, or eye infections.

He should be perfectly familiar with the operating-table and all its movements and possibilities.

He should have available for immediate use and understand thoroughly the emergency set for subcutaneous or intravenous administration of salt solution (Locke's formula).

Preparation of the Apparatus.

All anesthetic apparatus should be ready before the time set for operation. No anesthetic may be started until there is an ordinary mouth-gag, a Heister gag, tongue forceps, throat swabs, gauze, towels, fan, and pus basin *at hand.*

An ether can should be opened and a double-grooved cork with cotton wick should be prepared. Only the drop method on an open mask is to be employed, except on the special order of the operating surgeon.

N_2O–O_2 apparatus must be tested beforehand. The face mask must be clean and the valves working freely. All four cylinders must contain some gas or oxygen. New cylinders with *tried* valves must be available.

The method of cleaning the masks consists in boiling for the ether masks, and in soap and water cleansing, followed by ten minutes' immersion in 5 per cent. carbolic solution, for the gas masks with rinsing in sterile water.

The hypodermic tray should contain a syringe loaded with strychnin, gr. $\frac{1}{30}$ (0.002), and another with ♏xxv (1.7) of camphor in oil, and the following preparations ready for immediate hypodermic use:

Caffein.	Adrenalin.	Digalen.
Nitroglycerin.	Camphor in ether.	Morphin.

Preparation of the Patient

The blood-pressure must be known in all cases scheduled for operation. Urinalysis must be recorded, and operating permit signed by the patient if an adult, by the legal guardian if a minor or mentally incompetent, or by the hospital authorities if an emergency case be in profound shock or unconscious from hemorrhage *before* bringing the patient to the preparatory room.

Before starting the anesthetic, be sure:

(1) That the patient's mouth is empty, *i. e.*, artificial teeth removed.
(2) That there is no constriction about the neck.
(3) That the position is the desired one on the appropriate table—the patient should be as far toward the foot of the table as possible.
(4) That arms and legs are properly secured and no straining or cramping of limbs.
(5) That the head pillow is out, or is removed shortly after starting the anesthetic.

Administration

A. Choice of anesthetic.

The routine anesthetic for adults is N_2O, followed by ether; for children straight ether. Variations from this will be under instructions from the operator or the staff anesthetist.

Ether is contra-indicated in:

(1) Infections of the respiratory tract.
(2) Nephritis.
(3) Brain surgery.

N_2O–O_2 (continuous gas anesthesia and preliminary gas anesthesia) is contra-indicated in cases with the following:

(1) Blood-pressure above 165 mm.
(2) Myocarditis and serious valvular lesions.
(3) High-grade arteriosclerosis.

B. Guides to depth of anesthesia and condition of the patient:

(1) Respiration; somewhat quickened, deep and regular. Judge by the sound and by watching chest or abdomen. Noisy, stertorous breathing usually means the tongue has fallen backward.
(2) The pulse; note the rate, volume, and rhythm: it should be full and somewhat quickened.
(3) Color: This may be slightly cyanosed in continuous gas, but in no other anesthesia.
(4) Muscular relaxation and reflexes.
(5) The pupils: These should be small and sharply reacting; when testing, hold the lid closed an instant, then open toward the light. Never touch the cornea. Morphin renders the pupil test useless.

C. Details of administration:

Never be left alone with a patient after starting the anesthetic.

Take the patient to the operating-room as soon as possible after unconsciousness (not complete surgical anesthesia) supervenes and reach surgical anesthesia in the operating-room.

The anesthetist must concentrate his attention on the anesthetic. The operator wishes to rely on the anesthetist, but cannot be expected to do so if he finds him inspecting the field of operation instead of watching the patient.

Note the time of starting and finishing the anesthesia; keep a written pulse record every ten minutes on tablets provided for that purpose. (This need not interfere with constant attention to the pulse.)

Do not use tongue forceps nor ordinary mouth nor Heister gag unless it seems imperative. Extension of the head and protrusion of the lower jaw held under the symphysis suffices nearly always to open the respiratory tract. Avoid throat swabbing, which rarely reaches the mucus that is causing the noisy breathing and usually excites further mucus production. Avoid prolonged pressure at the angles of the jaw—it always causes soreness for several days, and occasionally a traumatic parotitis. In holding the jaw under the symphysis keep hands and fingers off the trachea and vessels of the neck.

Protect the eyes, and if ether does reach the conjunctiva instil a drop of castor oil at once.

Always remove the anesthetic during beginning dilation of the rectal sphincter.

During vomiting never interfere with tongue nor jaw. Turn the head and shoulders sideways, wipe out ejecta to avoid aspiration, and then crowd the anesthetic.

The anesthetic may be crowded:

(1) Just before and during the stage of excitement.
(2) Just before vomiting, as evidenced by swallowing motions of the throat and shallow, rapid breathing.
(3) Just after vomiting.
(4) At the operator's request, and if the patient's condition is good.
(5) When hypersensitive areas are being handled, as the diaphragm, the Douglas, and the perineum.

Avoid supersaturation of the mask—the excess ether is wasted, and may drip into the patient's mouth and throat and thus cause further mucus production.

D. Economy and statistics.

Two hundred and fifty grams ether cans contain 350 c.c. Measure by volume the quantity used at each operation; the first 350 c.c. should last from one and one-fourth to one and one-half hours, except for alcoholics and patients accustomed to narcotics and stimulants. N_2O cylinders contain 100 gallons. For continuous anesthesia the average is 200 to 250 gallons N_2O per hour.

Do not remove N_2O nor O_2 cylinders from the apparatus until empty. It is not necessary to start each operation with full cylinders. Some one must use up those partly empty.

E. Danger signals:

In ether anesthesia:

(1) Respirations shallow, gasping, or obstructed.
(2) Pulse-rate rising, volume decreasing (more than the length of operation or loss of blood warrants).
(3) Mucus accumulating in throat.
(4) Cyanosis beginning.
(5) Pupils dilating and reacting sluggishly or not at all.

In N_2O–O_2 anesthesia:

(1) Cyanosis.
(2) Muscular twitching—seen first about the eyelids and extremities.
(3) Eyeballs turning upward—pupils dilating.
(4) Pulse-rate decreasing.
(5) Respirations slowing—stertorous.

F. Efforts at resuscitation:

If the patient stops breathing:

(1) Remove the anesthetic.

(2) Artificial respirations, 15 to 20 per minute, combined with fanning or the use of oxygen. The upward arm motion or expansion of the chest must be simultaneous with outward traction on the tongue.

(3) Make sure of an open and unobstructed respiratory tract.

(4) Rhythmic tongue traction associated with artificial respirations.

(5) Lower the head and chest to stimulate the medullary centers. (In early chloroform cardiac paralysis, with engorgement of the heart and thoracic vessels, raise the head and chest for half a minute to help empty by gravity the overburdened heart and vessels, and then place body flat.)

(6) Heart massage—120 per minute. In the absence of a pulse, successful heart massage makes a palpable pulse in the carotid arteries.

(7) Drugs, hypodermic—strychnin, gr. $\frac{1}{30}$, repeated; camphor in oil, one or two barrels (♏xxv each); digalen, ♏x, repeated; caffein, gr. j.

(8) Stretch anal sphincter.

G. Responsibility:

Do not assume unnecessary responsibility when acting alone. If in doubt *stop the anesthetic*, and give air or oxygen until your doubt is removed. A struggling patient is better than a death from anesthesia. If the general condition of the patient is disquieting, announce the fact or facts on which your judgment is based to the operator.

Note.—These rules are in use in the Michael Reese Hospital, and were prepared by Dr. Joseph L. Baer, of the anesthetic staff of the institution.

MINOR SURGICAL TECHNIC AND APPARATUS

There are a few minor surgical operations that are usually done with the patient lying in bed. The operations are often left to the house medical staff and the nurse. It may be helpful, therefore, to emphasize some of the fundamentals of technic and list the apparatus and material required of the nurses.

Spinal Puncture.—*Instruments.*—Needle, 2½ inches long; syringe for injection of serum (Quincke trochar and cannula); sterile tubes.

Site of puncture is between the fourth and fifth or third and fourth lumbar vertebra, and an easy method of finding this is by going in parallel with the crest of the ilium. In children the needle is inserted directly in the midline, and in adults the needle is generally inserted about ¼ inch the other side of the midline and pointed slightly inward and upward. The patient's skin, the operator's hands, and the field of operation must be sterilized as for a surgical operation.

Position of Patient.—The patient is preferably lying in bed on one side, with head flexed on the chest, knees flexed on the thigh, and the thigh flexed as close to the body as possible, making the back as convex as possible, so as to separate the vertebra. Some prefer doing lumbar puncture with the patient sitting up, but in a reclining position. After the procedure the field of operation is best dressed by a piece of sterile cotton or gauze covered with a strip of adhesive plaster.

The needle is inserted as directed, and when it enters the spinal canal the fluid will immediately flow. It is never necessary to exert suction on the needle to withdraw fluid. A "dry tap" generally means that the needle has not entered the canal, but it may indicate an absence of fluid due to inflammatory involvement of the cerebrospinal meninges, which has closed the foramen of Magendie.

Venesection.—*Instruments.*—Two pair artery snaps; 2 pair tissue forceps; 1 pair stitch scissors; 1 pair small curved scissors; 2 small knives; 1 probe-pointed grooved director; 1 hook; 1 probe-pointed aspirating needle; 2 aneurysm needles.

In test-tubes, add—2 aspirating needles; horsehair and needles; silkworm and needles; white silk and needles: catgut No. 0 and needles; pipets.

Also add to tray—sterile towels; sterile brushes; sterile cotton; 2 medicine-glasses; camel's hair-brushes; bandages, all sizes.

The patient is lying in bed, with arm extended on the side of the bed. When time permits it is best to dissect down on the vein. The first procedure is to compress the arm above the elbow until the veins in the elbow stand out prominently. The skin incision can best be made by pulling the skin slightly aside from the vein and cutting to the level of the vein in one stroke. This avoids the danger of cutting the vein in the preliminary skin incision. The vein is then dissected free from the surrounding tissue and a ligature placed ready to tie. A sharp scissors is used to make a "V" incision with the apex pointing distally. When sufficient blood has been obtained the ligature is tied distal to the incision and the skin sewed up with two or three silk stitches. By some it is preferred to lay the stitches in the skin before making the incision in the vein and simply stop the venous flow by pressure. In case of emergency a knife-cut through the skin and across the surface of the vein will perform the duty.

Direct Transfusion.—For direct transfusion of salt solution or of drugs into the circulation the technic of exposing the vein, as above outlined, is employed. However, when the vein is exposed and dissected free two ligatures are laid, about 1 inch or more apart. The lower distal one is tied before the incision is made, thereby stopping the flow of blood. A small cannula is inserted through or cut into the vein and tied with the proximal ligature. In the meantime, the cannula must be connected with the solution for injection and all air-bubbles allowed to run out before the cannula is inserted in the vein. The constriction on the arm is then removed, and the fluid, always kept at body temperature, is allowed to run slowly into the circulation—fifteen minutes for 100 c.c. is the time generally used. After sufficient fluid is allowed the cannula is withdrawn, the proximal ligature tied, and the skin sewed and dressed as above described.

Subcutaneous Transfusion.—For infusion of salt solution, or of Locke or Ringer solution, an outfit containing the necessary apparatus should always be on hand. The sites generally selected for infusion are under the breast or the external aspect of the thigh. The needle is generally about 2 to 2½ inches long and of not very large caliber. The field of operation is sterilized as for a surgical operation, and the needle, connected with the fluid which is suspended at the proper height, is inserted rather deeply in the subcutaneous tissue. The fluid is allowed to flow slowly, and light massage is made over the area after the fluid enters the tissue.

Paracentesis.—Paracentesis thoracis may be divided into two parts: one exploratory, when the nature of the fluid is unknown, and, second, for the aspiration of a known non-purulent fluid. In either case, the site of the puncture depends on physical signs of localization of the fluid. After sterilization of the field the needle, attached to a good working syringe, is applied along the upper borders of the rib and gently pushed straight toward the pleura. When the pleura is reached there is a perceptible change in the resistance to the needle, which is then shoved a little further in in order to pierce the pleura. Suction is then made by means of the syringe and the nature of the fluid ascertained. If it is desired to evacuate a large amount of fluid the needle is then connected with an aspiration outfit, by which negative

pressure can be produced in the large receiving bottle. Negative pressure may be made either by a suction pump attached to the other end of a bottle which has valves, or in the absence of such an apparatus, a convenient vacuum can be obtained by burning alcohol in a bottle and immediately stoppering it.

In paracentesis abdominus a trochar and cannula is used instead of a needle, and the skin is generally nicked with a knife before insertion of the trochar. The incision of choice is about midway between the symphysis and umbilicus, after the operator has made certain that the urinary bladder is empty. The patient is best sitting in bed, propped up on pillows if necessary. In paracentesis abdominus there is some danger of shock, and it is always wise in all punctures to have stimulants ready for immediate use.

Wet Dressing Box.—Green soap; sterile gauze; sterile cotton; sterile towels; scrub-brushes (sterile); sterile camel's hair-brushes; toothpick swabs; bandages of various sizes; alcohol; ether; tincture of iodin; collodion; oiled muslin; rubber tissue; safety-pins; lap binder.

Preparation of Bodies for the Morgue.—*Contents of Morgue Box.*—Five pounds oakum; non-absorbent cotton; straight pins; stick; morgue sheet; safety-pins; bandages, 2- or 3-inch.

The Adult Body.—The body must be bathed all over with soap and water, the finger- and toe-nails cleaned, the hair combed and braided, and the ends tied tightly. The rectum is packed with oakum, and, if the body be that of a female, the vagina will be packed, and a large pad or diaper will be adjusted to cover rectum and vagina. The throat and nostrils must be packed with oakum and the eyes bandaged, with a wad of cotton underneath the bandage to press on the lids sufficiently to keep them closed. If there is a wound following an operation the dressings must be removed and clean dressings put on, with a sufficient amount of packing to prevent oozing. The dressings may be fastened with adhesive plaster instead of a regular binder. The ankles are tied together, and also the legs below the knees. The arms are folded over the chest, and the wrists are tied lightly together with a broad bandage, so that the skin underneath will not be discolored when the bandage is removed previous to burial. There need be no clothing on the body other than the morgue sheet, which must be invariably pinned in front throughout its whole length, the superfluous material being tucked in as a pad, especially over the face. The sheet must be pinned on in such a manner that the face can be quickly exposed.

The death report, fully made out, with name and all necessary data, must be pinned over the face to the morgue sheet. All jewelry must be removed from the body, unless otherwise specifically directed, and turned over to the head nurse. The body must be removed to the morgue immediately after the preparations are completed unless there are specific orders to the contrary. The head nurse of the floor must as expeditiously as possible thereafter send the patient's clothing and all other belongings to the office, and take a receipt in detail therefor.

The Child.—Children beyond the infant age will be treated as adults. The infant must be washed, and a diaper of gauze and cotton put on. The body must then be wrapped in a thin pad of cotton and gauze, and over this the morgue sheet, as in the case of adults.

Premature infants and still-borns must be treated exactly as other infants, and must under no circumstances be sent to the laboratory of pathology except on specific order of the superintendent of the hospital.

DEPARTMENT OF PATHOLOGY

In this era of pathology, bacteriology, serum, and vaccine therapy the department devoted to this work in the modern hospital may be said to have four functions: First, as an aid to diagnosis; second, as a part of the treatment of disease; third, educational as contributing to the literature of medicine; and, fourth, experimental medicine in the employment of animals for testing and proving theories that have for their ultimate object the cure of disease.

It might have been said only a few years ago that the chief function of the department of pathology was as an aid to diagnosis; that is not true to-day, and its office in the treatment of the disease after its nature has been definitely established is quite as important, as, for instance, in vaccine and serum therapy.

Almost the whole literature of modern medicine is made up of the records of patients on the wards of the hospital, and a very valuable part of these records is that which contains the work of the department of pathology. In the light of to-day's progress in medicine and its various branches there could be no literature worthy the name that did not contemplate urinology, bacteriology, surgical, and postmortem pathology.

The final function, and perhaps eventually the most important of all, concerns research into the cause and character of disease with a view to its cure, and this research function of hospital pathology is a question of the ambitions of individuals on medical staffs, of the caliber of men, of equipment, and of material in the form of patients with which to operate.

Hospital pathology as a well-rounded branch of administration, with definite clinical aims and clear-cut technic, is rather new, and clinicians themselves are just learning its resources and limitations. Its functions are not only to aid the men in the diagnosis and treatment of their cases, but to inspire them with a spirit of investigation, and to open up to them speculative fields for clinical study with its aid.

We need not look for very much inspiration in the laboratory from the older medical men, because they are not quite sure themselves, and they do not always know just how far the laboratory can go to help them, therefore the directors of the laboratory must keep in touch with staff members in the medical profession, and must act as a sort of binding link between the laboratory and the bedside.

It will not be necessary or profitable for us to go into the question of the extent to which a laboratory department can be carried in the hospital, but rather we might discuss very briefly some fundamental principles of laboratory operation as applied to hospital practice in conjunction with bedside work.

Who Shall Do the Work?—The most vital problem concerned in the organization and operation of a department of hospital pathology concerns the personnel—who shall do the work of the institution? The problem is not a very difficult one, and settles itself in the large, richly endowed institutions that can afford an elaborate organization; and, as a rule, in such institutions, which are almost always connected with a medical school, the routine work will be done by senior students under the direction of teachers in the school. The urines can be done by senior students who have passed a period of apprenticeship, and who are always under the eye of a trained analyst. Certain of the bacteriologic work, including the

staining, can also be done by senior students, but very much of this class of laboratory work is valuable from its educational side only, and very much more largely concerns the workers than the patients involved.

Where the chief function of the laboratory concerns the patient, and where that department is maintained as an aid to attending physicians in practice in the institution, medical students are not quite reliable if left too much to themselves. The institution that has for its prime and only function the care of patients has no medical school connection, and only in very rare instances will such an institution be properly endowed to maintain a large pathologic force. Not so very long ago it was the custom to charge patients for laboratory examinations, and it is the custom still in some places, but the custom is becoming obsolete, and it is coming to be a common view that the doctor is entitled to all the aid the institution can give him for the diagnosis and treatment of his case, and urine work, bacteriology, and pathology are coming to be regarded quite as essentially a part of the routine of the hospital as the dietary or good nursing. This innovation of providing laboratory work without a special charge against patients is throwing the burden of a large expense on the institutions which most of them cannot afford. But the whole question is one of education on the part of the physicians who bring their patients for treatment to the hospital, and physicians are now becoming so well educated in the laboratory side of their profession that they know what good laboratory work means, and they are quite able to separate the honor work and efficient service from all too common guess-work practice. After all, patients go to the hospital in which their medical advisor has confidence, and the day is not far distant when the semiprivate hospital will be equipped to fix a flat rate room charge for all its pay patients, with the understanding that the single charge includes everything the patient will need, including laboratory work. The room charge in such a case will be higher, of course, but the patient's bill will be smaller in the end, and the doctor and his patient will get very much more for their money.

This brief diversion was made necessary to emphasize the point that hospital laboratory work cannot be done in a competent and efficient manner by students undirected or by any one not specially trained.

Necessarily there must be trained experts in any department of pathology that will be entitled to respect. If the institution is a small one, one man with an all-round training will perhaps give a mediocre satisfaction in the organization of the department and in the checking up of the routine work undertaken by the institution in urines, bacteriology, and surgical pathology.

Where the work is more varied and larger in quantity, there ought to be, beside the director, one other trained man, preferably one skilled in bacteriology and work upon the blood, who can also do the Wassermann, Widal, and such other scientific tests. Good interns can usually be intrusted to carry out the technic of spinal puncture, the injection of antimeningitis serum, the antitoxins, and the various vaccines on the wards. A conscientious woman, who has had a medical training, oftentimes gives the highest order of satisfaction in doing the Wassermann tests, vaccines, etc., but the same person, however well trained she may be and however well informed, will hardly be satisfactory in carrying out the work on the floors of the hospital, for the same reason that women are not, as a rule, good surgeons.

In a good many institutions the interns do most of the laboratory work. Work done by these young men without expert direction is usually a fraud on the physician, who is looking to the institution for conscientious help, and a fraud on the patient, because it is not expert work.

There is a way, however, to employ the services of these young men most adequately and efficiently. There is no medical school in the country, with possibly two or three exceptions, that gives a sufficient practical training to its students to enable them to do the hospital laboratory work after they are graduated without the direction of an expert. In some institutions, however, and this seems to be a rather coming practice, the interns immediately upon their admission to the hospital are sent to the laboratory, and there given practical work for a few weeks in urines and blood work. If the young men have had a good theoretic training beforehand, with the amount of practical application of their training given to them by the better medical schools of the day, they will be prepared very quickly to do the laboratory work on the wards of the hospital as indicated in another part of this section, and especially will this be true if the attending physicians in the institution are sufficiently well informed about laboratory practice and laboratory technic to at least prevent indifferent or hasty work. A pretty safe method, with an adequate check on the results, is to have the junior intern, following his preliminary training in the laboratory, do all the work relating to his patients excepting the bacteriology and surgical pathology. By this method the junior intern will have his senior to check him up, and then both of them will have not only the attending physician, but the expert laboratory directors.

Most of the better hospitals of the time include, as a part of their staff organizations, certain of the younger practitioners, ex-interns, perhaps, who prosecute special work on the wards along the lines of a general scheme of investigation. These men not only bring fame to the institution in which they work by the publication of their researches, not only are of vast benefit to patients by the advanced scientific work they do in diagnosis, and during the progress of disease in the way of guidance in diet, medication, and general or special treatment, but they stimulate similar activity on the part of the intern corps; where these associate staff members are encouraged it will be found that the whole trend of the institution is toward high ideals, extending to the every-day care of patients, better history-taking, more careful physical examinations, more accurate laboratory investigations as a part of the general practice, and a high order of service in every direction.

Where the Work is Done.—In some institutions all laboratory work is done at one central point. Elsewhere a part of the work is done in small laboratories, scattered about the wards or floors of the institution.

In the first plan of work all specimens of whatever nature, and from whatever part of the institution, are brought to the laboratory properly labelled, and accompanied by a request from the physician for the kind and extent of the work he requires. A blank form of this sort is shown in the section on Records of Patients. There are some advantages to this method of operating the service, the chief of which is the reliability of the work done, because it will all be done under the direction and personal supervision of the trained men paid for that purpose.

In the second method there is a central laboratory for the more important work, and the small auxiliary laboratories located about the institution, convenient to the larger wards, where the simpler work can be done by interns on the various services. This is an excellent plan, and has many advantages and one or two disadvantages.

There is a great deal in the personal touch of the attending physician with his patient, and, whether it be a clinical finding or a laboratory discovery, the physician will usually want to see the result of whatever technic is applied, and he can

only do this where the work is done on the floors where he can see the slide or specimen without going a long distance to the central laboratory. Moreover, there is a good deal in the personal equation as applied to the men doing the work. When a specimen is sent to the central laboratory it is merely a specimen in the abstract, and has no identity, no significance, and no special interest concerning any particular patient or disease, in which case there is greater likelihood that the worker will rush the examinations in a routine way as a part of an uninteresting day's labor. It may be a case of nephritis that has been running in the institution for weeks, and the albumin content of the urine will be the only thing that the physician requires, and he not only wants to know the quantity, but he will want to have some sense of proportions and comparisons from day to day. Perhaps one man in the laboratory will make the examination to-day and another man to-morrow, and the personal equation in such case is entirely lost, and it resolves itself into a purely technical affair, and the work is rushed through; whereas, if the examination is made on the ward by the intern on the case, for the benefit of the attending physician, the examination can take on a personal relation, and a comparison can be made from day to day which will not only be illuminating, but an immense saving of time, because of the fact that only an albumin test need be made, which takes a moment; whereas, if it were done in the central laboratory a complete urinalysis would have to be made every time, which is a vastly different matter, and occupies a good deal of time.

Equipment of Ward Laboratories.—These small auxiliary laboratories need not be imposingly placed or elaborately equipped. If the institution is not very new and specially provided with such rooms or spaces a table in a corner of the ward will answer the purpose, or, preferably, a nook in some room or alcove outside, because the smell of boiling urine is not a pleasant one for patients. The simple reagents for sugar and albumin, a small hand or water or electric centrifuge, a microscope and slides, a blood-counter, a hemoglobin, and a blood-pressure apparatus will be all sufficient. A garbage can with tight cover will be found convenient as an inducement toward neatness. Hot- and cold-water faucets are desirable, but not absolutely necessary.

THE CENTRAL LABORATORY

It makes no difference how many rooms are employed for the central laboratory, the equipment will be practically the same. The urines, the bacteriology, the surgical pathology, and the postmortem processes must be done, and space must be employed within which to do them. For convenience of operation, and so that the people engaged in the different phases of the work can have their own things and be undisturbed while they are working, a series of rooms, however small, should be available, and we can now proceed to the equipment for this work, taking, first, certain of the fixtures that will be common to the whole suite.

The Instruments and Apparatus.—*The Microscopes.*—Perhaps the most important instrument of the laboratory is the microscope, and, as it is to be used for several purposes, one instrument will not be enough; and, even if the most expensive instruments are available for the central laboratory plant, there will have to be other instruments, vastly cheaper, if some of the laboratory work is to be done on the wards of the hospital.

The Zeiss instrument seems to meet with the greatest satisfaction for central laboratory purposes, and then, in the order of preference, might be named the Leitz, Spencer, and the Bausch and Lomb. The Zeiss is an expensive instrument, and for nearly all purposes will not be superior to the Leitz microscope, and the cheaper

makes of any of these firms will serve all the purposes of the smaller laboratories. A very good instrument for the interns to use can be purchased for about $75. Unfortunately, hospitals not connected with an educational institution must pay import duties on foreign-made microscopes, since the law does not permit hospitals to import free of duty; the laws, too, are very strict, and the government watchful to see that instruments bought by an educational institution that may import them free, are not used by an institution not allowed to import free. The law is wrong, of course, and if any institution ought to be allowed to import needful apparatus free it is the hospital.

The Incubator.—The incubator is the most important piece of apparatus in the bacteriologic room, used principally in growing cultures. There are two types of incubators purchasable on the market, one in which the heat is furnished by means of the electric current and the other by gas. Experience has shown that the gas regulators, owing to the variation in the pressure of the gas and the amount of dirt the gas sometimes contains, are frequently difficult of accurate regulation, and, of course, a constant temperature at the desired point is the prime requisite in a laboratory incubator. Quite recently an electric-heated incubator has come into the market and promises much more than the gas type. One of the difficulties in the way of maintaining a constant temperature in these incubators is that most of them have a water jacket composed of copper, and copper is an excellent heat conductor, so that variations outside the mechanism act quickly upon its interior. Experiments are now being made with an incubator heated with electricity that is composed of an outer jacket of wood with copper lining and asbestos or magnesia wool between, and theoretically, as well as in practical service, this promises to solve the temperature-regulation difficulties.

Laboratory Sterilizers.—In some laboratories there is a special steam chamber for the purpose of sterilizing culture-media and destroying cultures of pathogenic bacteria. A better method of destruction of these micro-organisms and a better mechanism for various sterilizing purposes is the common autoclave, and the one that seems to be most satisfactory is that made by the Bramhall-Deane Co. This autoclave is very simple in construction, is easily operated, has no complicated system of bolts and wheels, and can be used either with high-pressure steam from the engine-room, or by means of a small boiler with gas flame located under the mechanism. We have dilated more on the good points of the Bramhall-Deane sterilizer for laboratory purposes in the general section on Sterilizers.

Another sterilizer of great use in the laboratory is one in which the sterilization can be accomplished by means of steam not under pressure, and a serviceable type of this sterilizer is that known as the Arnold. This type has the door opening from the front rather than from the top. This instrument is almost imperative for the preparation of certain of the culture-media.

The Microtomes.—Every laboratory should be equipped with three microtomes: a paraffin microtome, a celloidin microtome, and a freezing microtome, with the necessary attachments for each. For the freezing microtome carbon dioxid gas is the preferable method of freezing tissues, and the gas is best dispensed from the ordinary tank of commerce. This tank can be fastened to the wall lying on its side, or even placed under the table on its side, and the microtome can be conveniently attached to the table itself. This microtome is usually equipped with small copper tubing, leading from the tank to the instrument with the proper attachments, and this copper-tubing method of attachment seems to be preferable to the direct connection of the microtome to the tank, because of a very much greater convenience in arrangement.

For all work a large, heavy machine is required for accuracy, and there seems to be hardly a choice between any of the standard makes offered for sale. Recently a comparatively new type of machine has been placed on the market, which can be used for either paraffin or celloidin work; this is the "wedge base" microtome.

The Paraffin Oven.—The paraffin oven for embedding tissues is essential in the pathologic room, and the particular type of oven that seems to be in favor with the pathologists is that shaped like a box and opening from the front, and in which the paraffin cups are placed inside the box.

Floors of the Laboratory.—The floors of laboratories should not be of wood, because they stain easily and are eaten away by acids; nor should they be of monolithic compounds, or stone or tile, because of the far greater glass breakage in a room with a stone floor. The best flooring for a laboratory is linoleum, and more especially the heavy "battle-ship" linoleum, of a single color, a quiet brown or gray. If these linoleums are oiled occasionally with a very little boiled linseed oil, and the oil rubbed in carefully, they do not admit of the eating processes of acids and reagents to any great degree, and will keep in good order and be presentable for a long time.

If it is a new building to be equipped, the concrete subfloor is made with a cove base extending several inches out on the floor from the wall, and then a drop in the concrete amounting to the thickness of the linoleum, which is cut to exactly the right size, and set into this frame with the regular cement sold for the purpose.

The Laboratory Hoods.—An important thing to consider in the construction of the hood is the flue leading from it. If the building is high and the flue extends to the roof it may not be necessary to have an exhaust fan at the exit, especially where large burners can be placed at the lower opening. In small buildings, and especially where the flue either does not go to the roof of the building, or where the roof of the building is below the roofs of adjoining structures, it will probably be necessary to have such an exhaust fan to draw out the fumes of gases, acids, and the like.

In most of the hoods in the new laboratories there are double openings—the main one at the top of the hood to carry off the lighter gases, and the other, near the bottom, carries off the heavier gases. It is well in such a hood to have a large-caliber lead piping, with holes in the side, and with an outlet leading to the upper opening in the hood for the purpose of oxidation.

The framework of hoods may be prepared either of woods treated with a fireproof paint or of steel coated with some paint that will not be affected by acids, gases, or fumes. It is the feeling of a majority of chemists that wooden hoods are preferable, because, in spite of the paint, steel work rusts, and it is impossible to maintain the hood so that it will be presentable. The bottom of the hood is usually composed of a slab of albaline, and under the floor there may be shelves for keeping various utensils, and for appearance the shelves may be enclosed with small doors. Leading to the hood are pipes for cold water and gas, and a small opening should be left in the floor of the hood for the exit of waste water. Fig. 144 shows an excellent form of hood that can be connected with any flue.

Laboratory Sinks.—There is now made a porcelain sink, about 2 by 3 feet in the bowl, with a flat bottom, on which acids and stains make but slight impression, and this particular form of sink can well be used in all places employed in laboratory work. In order that the breakage of glassware may be reduced to a minimum there is a wooden slab made to fit the bottom of the sink, with an end-piece at each end rabbited in so that the board cannot warp. Small auger-holes are bored at intervals in the board, or the slab may be a slatted affair made of crossed pieces,

leaving open squares ½-inch in diameter. This bottom can be painted with a waterproof paint, or with a preparation such as we shall hereafter discuss as a covering for laboratory tables and wooden furniture. Glassware falling on this wooden bottom will not break so easily, and the saving in specimen bottles alone will be considerable.

The Test-tube Board.—There is a board for the back of and just over the sink that will be found extremely useful. It is merely a dressed board, perhaps 2 feet

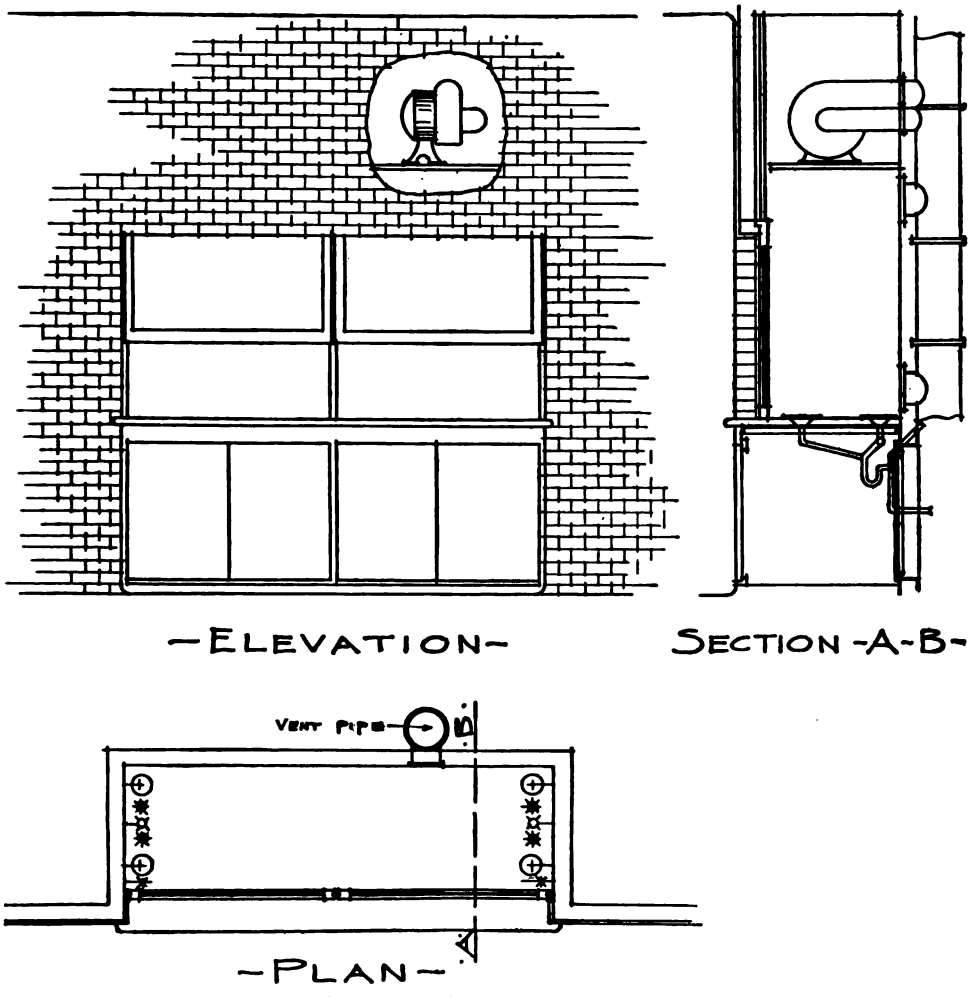


Fig. 144.—Laboratory room hoods.

square, with rabbitted ends to prevent warping, with a lot of wooden pegs driven in so that when the board is fastened over the sink the pegs will point upward at a slight angle as they leave the wood. They should be large pegs, and driven in so that about 2½ or 3 inches of the length protrudes. After specimen bottles and test-tubes are washed they can be stuck on these pegs, and they dry out quickly and effectively, because the sag of the bottle permits all of the water to run away. This board should also be painted with a stain-proof paint, and will then not be affected by water or the operations of the sink.

Tables and Work-benches.—Modern laboratories are no longer lumbered up with high work-tables in the middle of the room, interfering with the freedom of movement on the part of the workers, who must move quickly from one part of the room to another. The tables and work-benches are now nearly always fastened to the wall. They are narrow, as a rule, extending out not more than 2 feet, or even 20 inches from the wall, and they should be of convenient height, so that the worker may sit in an ordinary chair, say, about 30 inches high. There should be wall cases almost everywhere in the laboratory to contain bottles, small and large; otherwise the laboratory tables will always be littered up with an infinite number of bottles nearly all of which will be out of place and impossible to find when wanted. The doors and frames of these cases may be painted any agreeable color.

Paint for Tables and Furniture.—It has always been a great problem in laboratories to find a table or work-bench top that would not be constantly stained with acids and reagents. Marble and stone are impossible, because whatever falls on them, no matter how short a distance, will be broken. Wood, as it is ordinarily treated, or as it is ordinarily painted and varnished, is impossible because of the acids, reagents, and stains that fall upon it. Of late years there has been devised a preparation that seems to meet all the requirements, and the formula is herewith given with the method of its application:

Five Solutions

(*a*) Potassium chlorate..... 10 gm.
Copper sulphate..... 10 gm.
Water..... 1000 c.c.

Apply two coats of the hot solution. Allow first to dry before applying the second. Allow to dry and wash with water.

(*b*) Anilin hydrochlorid..... 12 gm.
Water..... 1000 c.c.

Apply one coat. Allow to dry.

(*c*) Potassium bichlorate, 10 per cent. in water.

Apply one coat. Allow to dry.

(*d*) Hydrochloric acid, 5 per cent. in water.

Apply one coat. Allow to dry and wash with water.

(*e*) Linseed oil.

Iron in with hot iron.

These five processes are applied, one after another, as soon as dry, a day or two between each coat, and several days should elapse after the oil is applied to allow the furniture to dry thoroughly.

Slide Cases.—Probably the most satisfactory method of filing pathologic slides is consecutively, and placing them in long boxes, which are then subdivided in such a manner that the slides will rest on their ends. If in doing this, certain slides, every fiftieth, for instance, have a number projecting free above the level of the other slides, it would be easy, by thumbing the exposed ends, to find ony one wanted. If slides do not accumulate too rapidly a very nice method of doing this is to use the ordinary card-filing case, subdivided as above described. In keeping such records it is necessary, in order that quick access may be had to any particular case, that three records be kept, one in a large book containing consecutive numbers, opposite each of which is to be found the patient's name and hospital number, doctor's name, nature of material and date. This book serves to keep track of the serial numbers. In addition to this book there should be a cross-card

index—one index should show the name of the patient, arranged alphabetically, and the other the organ. By this method, if it is desired at any time to obtain the pathologic findings of any case, or the particular disease of any organ, it will only be necessary to turn to that organ in order to find not only the number of the case and the diagnosis attached, but also the name of the patient, and in this way the case histories can be found. In many instances the index will be used only to find the diagnosis in the case of a certain patient, and here it is only necessary that we have the name. It is believed that by this arrangement an accurate record can be kept of all specimens coming to the laboratory.

Lights for Night Work.—The ordinary gaslight and electric light are wholly unfitted for the purposes of the microscope, and a convenient light for this work is a small white-frosted electric-light bulb, which can be attached to a block of wood and placed in any required position on the work-table, or a Welsbach may be used. These lights must be movable of course.

The Dark Room.—An essential part of a good pathologic department is a dark room, necessary, of course, if there is microphotography, and extremely useful for the polariscope. The ordinary dark room of the photographic studio will answer every purpose, and the room need not be a large one.

The Postmortem Room.—There seems to be a disposition on the part of architects and hospital administrators to place the postmortem room and the refrigerators for the dead in almost any out-of-the-way place not needed for other purposes, and wholly regardless of the lighting and ventilation. That this is a great mistake will become obvious to any one who will take the trouble to visit a number of hospitals. Where there is a well-lighted, well-ventilated, comfortable room in which to work, the postmortem room is one of the interesting places of the institution, and it will be found that when there are no postmortems to be done, the interns, and more especially the younger attending physicians and surgeons, will frequent the room, prosecuting their studies there, anatomically, either on the bodies of the dead or the bodies of lower animals. If the room is dark, ill-ventilated, and uninviting, no work will be in progress and it will be a neglected place.

Besides good light and good ventilation there should be a good refrigerator, large enough to hold not only the bodies of those who die until they can be removed, but with a compartment to contain anatomic parts. The postmortem room refrigerator is of some moment, the crates for the box being the most important part. In a great many postmortem refrigerators there is a plain slatted slab on which to lay the body, and it is difficult to get the body in and out on this slab, and generally two boxes are needed or two stools, and it is a back-breaking process.

A very convenient mechanism is a double-slide arrangement, on the principle of double-door elevators, where one door goes part way out and in and the second door goes the other part of the way. The mechanism is on a double set of wheels, and the sides of the slab operate in a groove, and act as a lever to hold the body in suspension, even after it is three parts of the way out of the box. The sides of the slab ought to be of heavy stuff, either metal or strong wood, preferably 2 by 6 inch pieces of oak, the full length of the refrigerator, and the crate is built up between these side pieces.

Most postmortem refrigerators are now cooled by nitrous oxid or ammonia pipes as a part of the general refrigeration scheme of the hospital. Ice can be used above the boxes where there is no refrigeration system.

The floor of the postmortem room should be of cement, sloping from all sides to a central trapped drain, which may be placed under the table. The walls

should be of some material that will permit of washing with a hose, and to this end the room ought to be as free as possible from everything excepting the apparatus to be used in postmortem work. If there be a small amphitheatre, so that an audience can attend autopsies, there should be at least a 6-foot solid wall between the arena and the audience seats, so that at least the arena can be kept clean and sweet.

There must be a sink with a large bowl, stoppered at the bottom, for hot and cold water. It may be necessary oftentimes to wash large organs, and the sink ought, therefore, to be made so it will hold water. In some operating-rooms there is a cold water outlet with hose attachment over the operating-table; experience does not develop a great amount of usefulness for water above the table, and the use of water at that point is disagreeable and oftentimes splashes over the clothing and faces of the people at work. A bucket of water and a large sponge serve the purpose, or, better still, an open-mouth small hose at the side of the table, worked with a self-closing faucet.

The Postmortem Table.—Just how the postmortem table should be arranged is a mooted question, and various types have been recommended. A very good scheme is the one used at the Massachusetts General Hospital in Boston. This table is arranged in the form of a box about a foot deep, and either composed of, or covered with, sheet iron. Across the top of this box is stretched iron netting, with rather close meshwork to prevent instruments and tissues falling through into the box below. At the bottom, in the central part, is a large outlet for fluids and water. The water pipe extends through the bottom almost to the top, and is here connected with rubber tubing, which, in turn, is connected with a copper receptacle measuring about 18 inches in length, about 12 in width, and about 12 in depth. The rubber tubing is connected with the bottom of this receptacle, which can be moved to any portion of the table desired. As the water is allowed to flow continuously into this vessel during the postmortem, it will be seen that one great advantage of this type of table is that, regardless of where the vessel may be placed, the overflow will run through the iron meshwork and not over the surface of the table and on the floor, as occurs in so many old-fashioned marble-top tables. The marble-top table as usually made for this purpose is of doubtful advantage, owing to the sloppy appearance which it generally presents, and to the fact that, when a body is on the table, the central opening, which is supposed to allow the escape of fluids, is usually blocked by the body itself, thus defeating the purpose for which it is intended.

The placing of a fan at the side of the outlet, such as is done in the Massachusetts General Hospital, to suck away the odors which are usually present is a very good scheme, but in many places hardly practicable.

The Animal Room.—Every hospital should keep at least a few animals for pathologic purposes, and the larger institutions will, of course, keep many animals of the smaller varieties, like rabbits, guinea-pigs, rats, and mice. Even where no research work is done, and where no educational activities are contemplated, guinea-pigs will often be required in the diagnosis of tuberculosis, for instance, and this work at least is necessary for diagnostic purposes.

If proper quarters are provided for these small animals they ought not to be very expensive or give very much trouble—guinea-pigs, especially, increase rapidly and thrive under any sort of decent conditions. The other animals—rabbits, rats, and mice—do not do so well except under the most favorable conditions. Rabbits are subject to an infinite number of skin diseases and catarrhal affections and epidemics of one sort and another, and, when the stock has to be replenished

from the outside, oftentimes an epidemic will strike the burrow and destroy them all.

Rats and mice eat their young if they are not fed properly, and they, too, are subject to diseases of many sorts.

It appears that almost always the darkest, dampest, and dingiest room in the house is selected as the quarters for the animals, and then the hospital management wonders that it has bad luck with its stock animals. All these little animals ought to be kept above the ground and in well-lighted quarters, and their habitations ought to be kept clean. Rabbits, at least, ought to have a runway, and if they have a burrow out in the yard, and are allowed to increase without the advent of new stock from the outside, and are properly fed on cabbage-leaves, new grass, carrots, potatoes, and turnips, they will thrive nicely and keep in good condition. It does not make so very much difference about the size of the stock cages, but there ought not to be too many animals in a cage. A dozen or twenty guinea-pigs will thrive and breed rapidly in a cage 5 or 6 feet long and 3 feet wide, made out of small mesh-wire. A half-dozen rabbits can be kept in such a cage, but they will not breed satisfactorily unless they can get into the ground and have more room and some seclusion.

The inoculation cages for both rabbits and pigs are usually 24 inches long, 17½ inches wide, and 15½ inches high. The animals, after inoculation, need very little room, and the cages can be kept close together.

The room in which the animals are kept ought to be so arranged that a hose can be turned on it, and it should be possible to seal it perfectly so that it can be given a formaldehyd fumigation whenever necessary.

Frozen Sections.—Every modern institution that pretends to do surgical work undertakes, or should undertake, to aid the surgeon in the establishment of his diagnosis while the patient is on the table, and so quickly after the tissue is taken that the operator may have the advantage of his finding in the final disposition of his surgical procedure. For instance, there is a breast tumor to be removed. It is axiomatic with surgeons that every tumor of the female breast is guilty of malignancy until it is proved innocent, and if immediately after the tumor is removed a frozen section can be made of the tissue at several points of the tumor, and a reliable diagnosis of innocence can be made, the surgeon will be enabled to close up his wound and limit the operation to the actual removal of the tumor. If the pathologist finds, however, that there is cancerous tissue or suspicious looking tissue in the specimen given to him, the surgeon will want to invade the armpit, remove any glands he may find there, and remove the breast.

Many times where these frozen section facilities are not available, the surgeon will either be compelled to assume the gravest character of the disease and so prosecute his operation to perhaps dangerous lengths, or he will have to close the wound, with the possibility that he may have to do a second stage as soon as the laboratory has made its report in a day or two or at some subsequent time. It is true that frozen-section pathology is not nearly so valuable and trustworthy as an examination of tissue done by the longer processes possible in the central laboratory of the institution, but, for the immediate purposes of the surgeon, the frozen-section method is imperative.

A very small equipment is required for this frozen-section work, and a very small space, enough for a table 2 by 3 feet and a stool for the pathologist, somewhere convenient to the operating suite; under the table he will have his tank of carbonic acid or freezing gas; on the table he will have his microtome, a large dish of water for the handling of sections, a microscope, a box of slides and

cover-glasses, with the few bottles of stains that he may need. The technic of this frozen-section work is clearly within the realm of the pathologist and has no place here.

The Museum.—Wherever surgery is done, or any attempt is made to do interesting scientific work, either upon patients or in an educational way, there ought to be a pathologic museum, and, however humble and simple such a room appears, there are a few principles that must be considered, the chief of which is the lighting scheme. Bright or direct light causes the colors in prepared specimens to fade rapidly, and, therefore, the light ought not to be too great, and it should be indirect; even a very dark room may be used for museum purposes, with electric or gas light, to be turned on and off when necessary; or the windows, if the room is well lighted, should be of dark-colored glass or covered with some dark material, such as heavy curtain cloth; or the shelves themselves may be covered with drop curtains, which will answer the same purpose. The size of the room will be, of course, a question that will depend on the amount of work to be done and the character of specimens to be saved. In a good many hospitals everything is saved, and, where this is the custom, the collection is usually very systematic and the specimens are tabulated and indexed and cross-indexed, and sometimes there is even a triple index, under the head of (*a*) the name of the patient and number, (*b*) the organ from which the specimen is taken, and (*c*) the disease illustrated in the specimen. If the arrangement of specimens is properly done a comparatively small room, with ample wall shelving, will hold an immense number of specimens, and then a double row of shelving may at some future time be erected in the center of the room, leaving a walk-way all around. In some hospitals test-tubes are used for museum specimens, such as the appendix specimens, and these test-tubes are sealed with a cork and paraffin, and certain classes of specimens are placed together in boxes or cans and indexed so they can be immediately found.

The Refrigerators.—In some part of the laboratory suite there must be a refrigerator, preferably in the bacteriologic room. The size of this refrigerator is not nearly so important as its reliability in temperature. If the institution is large and serum work is attempted there might be a second refrigerator for the serums, and if there are two refrigerators the problem of temperature will be a good deal simplified. Most culture-media with contents last longer at a temperature of about 38° F. and up to 40° F. Serums must not be kept above about 45° F. and they often freeze just under 40° F., after which they are worthless.

The refrigerator can be connected to the refrigeration plant of the institution, if there is one, and the ordinary regulation of the whole plant will serve all the purposes of that refrigerator, but very careful laboratory men find great difficulty in maintaining an even enough temperature and one that can be accurately controlled; they sometimes prefer an old-fashioned ice-box, in which a block of ice will keep to a temperature just low enough without danger of freezing.

PATHOLOGY IN THE SMALL HOSPITAL

It will not do any longer for even the smallest and most unpretentious hospital to take the ground that it cannot afford to do pathologic work. Pathology, bacteriology, urinology, vaccine, and serum therapy are very much more a part of the modern practice of medicine than the drugstore, and the hospital that cannot afford to give its patients these diagnostic and therapeutic advantages cannot afford to exist, and will be a menace rather than a help in the community.

But it will not be necessary for a small institution of 25, 50, or even 100 beds

to maintain an elaborate pathologic equipment. Perhaps one good man, trained to his work, will be sufficient, with an assistant in the person of an intern or even an intelligent pupil nurse, or, better still, a permanently employed young woman, fairly intelligent in mind, conscientious in method, and skilful with her fingers. Almost the whole expense of such an organization will be the salary of the expert and the renewal of breakages. The original equipment for a sufficient plant under such an organization can be provided for $800 or $1000. One large room will serve the purpose, or a large room and a small one, and the equipment will be pretty well satisfied if it includes an ordinary ice-box, an incubator, a single steam sterilizer, such as the Bramhall-Deane, which costs about $125; a good microscope at, say, $100; one microtome, at $75; one incubator, at $50; a centrifuge, at $50, because a cheaper one will not throw down bacteria; and then a few pieces of smaller apparatus, such as scales, water-bath, water-vacuum filter, all of which are inexpensive, and the necessary glassware and reagents.

Such an equipment will not be ample to do a great deal of work, and will necessarily be limited as to the broadness of the work, because no man will be found who can give an adequate service on anything like a workable scale in the urines, blood examinations, the technical tests, and at the same time make blood-counts, hemoglobins, blood-pressures, and do the vaccine and serum work on the patients in the institution.

However, where the institution is small, there will probably not be more than one or two attending physicians or surgeons who would appreciate the significance of even the modest work outlined here, and it could well be that such a pathologist would have to lead and inspire the attending physicians in the institution rather than be overworked by them.

THE DEPARTMENT OF HYDROTHERAPY

In this modern day, when the dosing of patients is on the decline, and dietary and physical therapy are on the increase, every institution employed in the care of the sick, and that pretends to scientific attainment, must be equipped with at least a modicum of apparatus for hydrotherapeutic treatment.

While it is not the purpose in this book to discuss disease from any medical standpoint, it might be profitable as a prelude to the equipment of a department of hydrotherapy to very briefly consider the avenues along which water in some form is intended to be beneficial in the cure of disease.

It may be stated broadly, at the outset, that water is employed for one of three primary purposes:

First, as a means for the introduction of certain medicines, more especially the mineral salts.

Second, as a physical agent, by which the skin and periphery of the body are irritated or stimulated to a point where the blood-vessels dilate as an invitation to large quantities of blood to leave the centers, that is, the internal organs, and thus allow those organs to resume a function that has been greatly impeded by what we call congestion.

Third, purely for its mental impression on patients, especially those suffering from some form of nervous disease.

There is still a fourth employment of water, namely, that principle used in the tubbing of typhoids, pneumonias, heat prostrations, and the like, where high temperatures must be lowered speedily; but hydrotherapy is hardly to be thought of in this connection, and no special apparatus need be supplied beyond a common bath-tub or wet sheets.

The biblical pool of Bethesda was an illustration of medicinal waters, administered to the outer surface of the body, and all down the ages there have been "springs" and "baths" whose virtues are supposed to reside in certain mineral salts in solution in the waters. These curative waters are scattered everywhere about the earth, and some of them have earned great fame, some perhaps justly, and others because whatever virtues they may have had have been supplemented by carefully devised courses of treatment, diet, and exercise in adroit and skilful professional hands.

The school of hydrotherapy began in Germany, and was known as a water cure or "the baths," because patients were sent to towns or to villages in which there were springs of some supposed virtue. Patients drank the waters and were bathed in them. People flocked to Germany from all over the world to take the baths, and they did so because there were many cures effected, and there is no doubt that many of these cures were due to other factors besides the waters and the baths; the family physician ordered his patient to take certain baths at a certain place, and sent him to some particular specialist there; the very fact of this order aroused the patient to a realization that he was a sick man, and the result was that he was in a mental frame of mind when he arrived at his destination to place himself unreservedly in the hands of his physician and to obey orders. These orders usually contemplated diet as well as baths and drinks. A great many of these people

were in those days, just as they are to-day, troubled with functional disturbances, due either to indiscretion in living, diet, or dissipation, or to the strenuous business lives they were living. Such a patient, placed on a restricted diet, given regular exercises, and drenched pretty well with water—no matter what kind—was almost bound to be benefited.

The German waters in this way have become famous for their curative properties, and Germany has built up an immense industry, especially in such cities as Nauheim, Carlsbad, and Baden-Baden.

The prosperity of the German watering-places called forth a great number of imitators, and people in all parts of the world began to exploit springs of various sorts, and it made very little difference what was the nature of the water or its temperature, so that it was in some one thing out of the ordinary. In this country there grew up in the neighborhood of several of these springs prosperous communities, the permanent population in which had a common purpose in the exploitation of their springs, to the end that a thriving trade could be worked up with strangers at the hands of the population and of learned men in the medical profession. From time to time efforts have been made to manufacture some of these "waters," and to employ them at the patient's home rather than send him across the earth to secure their benefits; or the actual waters have been bottled and shipped for use, but the other elements of treatment have been usually lacking or carried out half-heartedly, and, therefore, the same amount of good has not come about in most instances.

But in all these localities there are great numbers of doctors, and patients are given not only the waters, but more or less careful auxiliary treatment, and usually the success of the place depends even to-day on the adroitness and professional skill with which the medical practitioners treat their patients professionally in other ways besides the waters.

Upon the heels of the "springs" and "baths" finally came the era of artificiality, in which nature was aped by mechanical invention, and in this way the modern hydrotherapeutic departments in institutional work came into effect. Ordinary river waters were treated and made to masquerade as mineral spring waters; any temperatures could be achieved; calisthenics and athletics could be employed; diet could be regulated as in the watering-places elsewhere.

In this way and by easy stages hydrotherapy has come down to us at the present time. In all these years vast experience has been acquired, and it seems that we are just now on the eve of a definite parting of the ways. Charlatanism and mental therapy, working hand in hand, are choosing a ceremonious magnificence of equipment, much mysterious, sleight-of-hand work and more so-called "suggestion." On the other hand, has come to us something of real value in the hands of modern, up-to-date, and honest practitioners of internal medicine, and with these men hydrotherapy means something very real.

It is certain that very many disturbances of the brain and nervous system have their origin in an active congestion in the brain and its membranes, and a tremendous number of diseases of every part of the body are due to disturbances of the circulation, whereby the heart, called upon to do more than its normal work, becomes fatigued. The first effort of nature to help compensate the circulation results in an increase in the size of the heart muscle. This heart dilatation, hypertrophy, and a subsequent dilatation changes the relation of the vessels to the valves that control them, and we get what we call heart leaks or broken compensation. In this condition the heart works hard, but does little, because a considerable part of the blood leaks backward and is not driven through the vessels and into the

arteriovenous stream as it ought to be. All the patient's functional organs become clogged because too much blood remains in them, as in a reservoir, and interferes with their functional activities, and this condition is expressed by a pale, waxy hue of the face and cold, clammy skin and extremities of the patient. Under these conditions medical heart stimulants have about the same effect as whipping a tired horse. What we want to accomplish in these cases is to move the blood in the easiest possible way, and with the least work of the heart, away from the great central organs of the body and out into the muscles and skin and extremities. And we do this with water under conditions that will so shock the nerve ends that the arteries and capillaries will be dilated and thus invite the blood stream, rather than by remaining contracted repel the stream and dam it back into the centers.

The Douche.—Experience has shown that the best way to bring this result about is to employ alternate hot and cold douches, the changes being made so rapidly that the temperature of the body cannot possibly be raised by the hot douche or lowered to the point of chilling by the cold douche. Anything in the shape of a douche, spray, or shower will bring about this result, provided the temperature of the water used either changes rapidly or varies greatly from the temperature of the body.

The Nauheim.—Another way to achieve this same purpose is by the application of either chemic or physical irritants to the skin. One of these methods we have in the so-called Nauheim bath, in which gas-bubbles of carbon dioxid are released on the patient's body while he is in a bath at about or just a little below the normal body temperature. There are certain chemic bricks which when dropped in the water will break up into certain constituent elements, releasing carbon dioxid gas, and this gas rises as bubbles from the bottom of the tub, attaches itself to the patient's body, and, because it is lighter than water, works its way upward on the skin, irritating as it goes, until it finally bursts into the atmosphere at the surface. Perhaps a cleaner, if not more economic, method of achieveng the same purpose is to employ tanks of carbon dioxid gas, and a nickeled coil can be made to circulate the bottom of the bath-tub, with small pinholes at ½-inch intervals along its length to release the gas particles. The tank is connected to this coil, and the gas is released at the bottom of the tub after the tub is filled with water at the proper temperature and the patient is placed in it. At the end of ten or fifteen minutes of this sort of bath the patient comes out with the body and the skin and surface muscles full of blood drawn away from the great central organs, and with corresponding relief to the breathing apparatus and the heart's work, because an immense quantity of blood has been coaxed, as it were, away from the centers out into the newly dilated peripheral vessels.

Another way of bringing about the same result is by rubbing the patient with sea salt or any other kind of salt, or with any more or less irritating substance, immediately after or at intervals during a bath in common water. This method has the disadvantage of applying the irritant to only a small part of the body at one time, unless the rubbing is very vigorous and takes in large areas of the surface, and there is hardly a question that the virtues of mineral baths and salt baths of various sorts are dependent on this very quality of irritating the skin and thus dilating the peripheral vessels, and to this extent, and perhaps to this extent alone, the mineral waters of certain springs are efficacious.

Dry or Vapor Heat.—There is another way, besides those mentioned, of increasing the peripheral circulation of the blood, and in that way emptying the great central organs of their superfluous supply, and that is by the direct application to the skin of vapor or dry heat. This is dcne in the so-called cabinets, or sweat

baths, or "bakes," and there is little doubt that the physiology of this sort of heat action is twofold: first, it has an irritant action, that of heat itself, and thus serves to dilate these small vessels; and the second action is the sweat process of withdrawing water from the body, and is a physiologic form of depletion which it will not be necessary for us to go into in more detail; the main point is that the process brings about an increased circulation of the blood away from the great central organs that have been so clogged that they have been unable to perform their functional duties.

A good many medical men have begun to use the "bake" in a local way also in cases of neuritis or rheumatism, caused, perhaps, actively by the presence of uric acid or other toxic matter, which, acting as a direct irritant of the nerve ends in the particular locality affected, may give rise to the pain or neuritis or rheumatism. The "bake" in these cases performs the same office, but in another way, that is, it increases the circulation of the blood in the part affected, and that increased blood activity serves to carry away the poisonous matter in the blood stream somewhat in the same way that a great rain storm flushes the sewers and cleans out the city.

Passive Resistance Exercises.—Great numbers of the people who go to Europe to the baths are men and women well along in years, who have lived sedentary lives or who have dissipated a great deal, either at the table or in the matter of alcoholic stimulants. They have had functional disturbances of the various organs of the body for many years, but, because of their youth and strength and recuperative powers, they have been enabled for a long time to recover from these periodic or occasional attacks, brought on generally by some special overindulgence, either of work or dissipation. But finally age comes along as a side issue of the seizure, and they are unable to "come back," as the athletes have it. If they are financially able to do so they are ordered by their physicians to travel and go to the baths of Germany or elsewhere, and there they place themselves under the rigid discipline of a doctor, and are ordinarily helped along by diet, depletion in some such way as we have outlined, and flushing with the waters. Eventually there comes a time when these artificial agents no longer serve the purpose. The heart refuses to pick up its work well, the blood is hardly set in normal motion in some one of the ways we have suggested before it again settles into the centers, and the heart, like a great pump with too small a suction-valve, pounds away, accomplishing little.

We must resort now to another, a subtler, a gentler, and a less shock-producing method of coaxing the blood away from the centers, and this we do by a process the best known form of which is Dr. Schott's passive resistance exercises. There are a great many movements in these exercises, involving, first and last, nearly every muscle of the body. It will not be profitable for us to go into detail as to these movements. They are treated in exhaustive chapters in all the medical works on the heart and circulation and metabolism. Suffice it to say that the muscles of the body are moved at different times and in varying degrees of activity against an almost imperceptible resistance on the part of the patient, and this gentle work of the muscles calls the blood away from the central organs to compensate for the waste of muscular tissue by work, the difference between this and the former methods of evening up the circulation being that this particular process has for its object a more lasting result. These movements are made to take up a great deal of time, beginning with perhaps five- or ten-minute periods and increasing from day to day until a half-hour can be devoted to the work, and eventually a considerable amount of exercise can be gained without overworking the heart, as would be the case if it were active exercise performed by the patient himself.

Many patients, old men and old women, come for treatment with heart beating

at 125 per mintue, in a flabbly, sluggish sort of way, and at the end of the day's treatment with these passive resistance exercises the heart will have subsided to 90 or even 80, and its beat will have taken on a better tone and will have become more productive of results. At first this improvement will last for only a short time, but after a while the improvement will continue for many hours, and eventually the heart will have settled down regularly to the profitable employment of getting the blood stream through all parts of the body.

Massage.—Massage is a somewhat different thing, but it is proper that massage should be done in connection with a department of hydrotherapy because its ulterior purpose is along the same general line. Massage of a muscle, no matter which muscle, is the working of that muscle involuntarily, so far as the patient is concerned. It is passive motion again, and the kneading process employed in massage calls the blood supply to the part, stimulates metabolism, and not only improves the quality of the muscle and increases its usefulness, but it likewise withdraws from the centers the additional amount of blood necessary in the performance of the muscle work, and thus helps in a small way to relieve the clogging of the centers.

But massage has another purpose. Generally speaking, in those who are proper subjects for general massage there is a great deal of unemployed fat in the tissues. No voluntary movements of the patient will serve to increase the blood supply in that fatty tissue, and hence, after a while, we have a condition in the fatty tissues of the body that might be likened to a swamp where water stands and where nothing happens, either in the water or in the soil. The whole area becomes waste and worthless and unproductive. But the waste isn't carried away because there is no running water—or no flowing blood. To relieve this condition we must bring in some artificial stimulation to increase the blood supply, to carry away the waste-products, and to release the constituents of the fats out into the blood stream that has been brought there, and so get rid of the whole marsh. Therefore, we pinch and knead and punch the area. We "insult" the locality, as the physician says, and blood rushes in as nature's way of coming to the rescue, and in this way we flush out these fatty areas and carry the waste away.

Having now considered some of the uses of water in the treatment of disease and the ulterior motives behind its employment, we have to consider the apparatus necessary in the equipment of such a station in an institution.

For the small institution with small funds and perhaps little room much may be done with very little apparatus, and that of inexpensive design, such as a large tub for plain or medicated baths, and in which an excellent Nauheim may be given by the use of the chemic carbonic acid gas bricks, and which may be used also to give sea or other salt rubs or so-called "glows."

A shower, with plumbing so arranged that it may be quickly changeable from hot to cold and vice versâ.

A sweat cabinet can be home made: merely a tight box with a hole in the top for the head, and with a few steam coils inside, arranged behind a grating so the patient cannot touch them; a long thermometer protruding from the inside, so that it may be easily read by the attendant. If an "arm-bake" and "leg-bake" are desired, these can be made with sliding panels in the sides for the arms, and with panel section in the front for one or both legs, on the principle of the old-fashioned prison stocks.

A strong, narrow table 3 feet instead of 30 inches high for purposes of massage.

This simple equipment can all be installed in one large room, and, if partitions made with canvas hung on nickeled tubing are used, a single operator may care for two or more patients at a time—one in the cabinet, one in the tub, and a third

under the operator's hands on the massage table. Fig. 145 shows this arrangement very well.

There ought to be a second room with rest couches, separated also by canvas partitions. A few lockers for patients' clothing and the bath-robes and a few chairs will complete an unpretentious but very serviceable equipment.

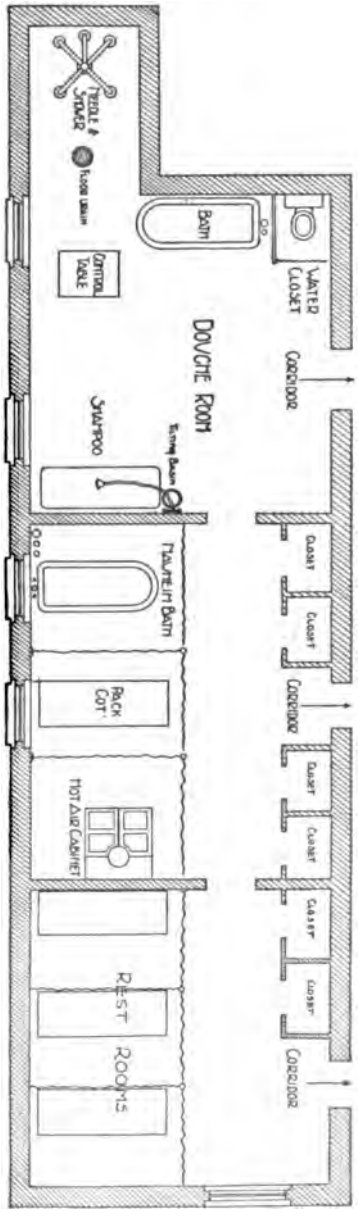


Fig. 145.—Arrangement for hydrotherapeutic suite.

For the large general hospital, the insane asylum, or the pretentious sanitorium, where a more elaborate equipment is desired, there should be at least three rooms, the most important of which is the douche room, because here must be installed the douches, needle sprays, showers, and the salt baths. Fig. 146 shows an assemblage of these devices. The difficult essentials for success in this room are (1) a properly constructed control table, (2) a lead basin at least a foot deep over the whole floor, with drain and slatted floor, and (3) properly constructed walls that will withstand steam vapor and hot and cold water.

Control Table.—It will be rather superfluous to go into a description of a control table, because the makes of the different manufacturers are practically alike. The tables are usually made of marble, with nickeled finishings. There is a mixing chamber on each side in the interior, and these lead to the various sorts of outlets—that is, the douches, needle spray, shower, and the various sorts of baths. Some of the tables have an ice-water connection, besides the usual hot and cold, but most of us find this ice water wholly superfluous, excepting perhaps in the hot climate of the South, and even there there is usually a great enough difference between the hot and cold water to obtain all the shock necessary to the system. The temperature of the water is regulated through the mixing chambers by sliding valves operating on regulating levers in the face of the apparatus. There is a douche spout coming from each mixing chamber—that is, one on each side of the apparatus—and it is from these we obtain the alternating hot and cold douche. There are two thermometers, one on each side of the apparatus, and each one connected with its mixing chamber, for indicating the temperature of the water as it passes through the chamber. In some of the newer tables there are also two electric thermometers, the temperature device resting in the mixing chambers, and the electric controls operating a bell, through an ordinary dry cell battery: this electric mechanism is used as a thermostat and as

an alarm, to indicate the maximum and minimum heat and cold points for the protection of the patient.

The details of the control table are so nearly alike in all the makes of apparatus that the differences of mechanism between the various varieties need not greatly concern the hospital administrator who proposes to purchase an apparatus, and his chief anxiety must be directed to obtaining a mechanism of installation that can be absolutely depended on in the matter of temperatures. All the makers of this control table claim exceptional devices for controlling the temperatures to the smallest fraction of a degree, but it is the experience of most of us that none of them live up to the claims made for them, and there seems to be only one method by which the temperatures of the water in the two sides of the control table can be maintained over any considerable length of time, and that is by arrangement of the plumbing outside the table itself. Where the control table is fed from a common circulating system it is impossible to control the temperatures.

Fig. 146.—The water-room of the department.

For instance, we may desire a temperature on one side of the table of 105° F., and we manipulate the temperature lever until we fix that temperature definitely by the introduction of hot and cold water into the mixing chamber on that side; but presently the faucets at some remote point in the circulation of the cold water are turned on, which has the effect of immediately dropping the pressure all along the line, including the mixing chamber, and, therefore, the relative pressure of the hot and cold water are changed. More hot water rushes in because the cold water pressure is reduced, and the temperature runs up so rapidly in some cases as to burn the patient before the alarm is given, and the contrary may also occur, that is, the hot water may be drawn upon and the pressure reduced, allowing a greater amount of cold water to rush in and the temperature is lowered rapidly.

In a great many instances the alternating hot and cold douche, in fact, any of the various forms of control table therapy, are used in connection with nervous patients, and such a patient is not likely to be improved if the water in the bath is

allowed to jump almost instantly from body heat (98.6° F.) up to 120° or 130° F., or from body heat down to 55° or 65° F., and oftentimes great harm is done by fright to the individual and a shock to the system, and any good that could possibly be accomplished by the use of the apparatus is destroyed. So important is this temperature regulation that we should go clear back to the power-house for our supply, from which the pressure will always be the same. It will be all the better for the regulating effect if the hot- and cold-water pipes can come directly off the power-plant reservoir, and are entirely independent of any circulation pipes whatsoever.

Needle Spray and Shower.—This device is not only a very popular, but a most efficient method of employing water in the treatment of disease. There are four columns of tubing, rising square-like, each equally distant from the other, with the pipes bent to converge at 6 or 7 feet from the floor. Beginning knee high, and at intervals of 6 or 8 inches, there are 3½-inch rose sprays leading from each point for the needle spray and there is a shower at the top. The rose sprays are set in ball-bearing joints, permitting a free movement to fix the direction of the small streams.

While all the manufacturers of control tables are making sincere and serious and progressively successful efforts to improve their devices, it seems that the J. L. Mott Co., of New York, has, up to the present time, given the matter more attention than others, and has produced a mechanism of better workmanship and of more perfectly working parts than others, and capable of a more certain control.

We show in Fig. 145 a very well designed hydrotherapeutic suite that may be elaborated or contracted to conform to any special conditions desired.

THE HOSPITAL PHARMACY

Equipment of the Drug Store.—The question of drugs naturally is not nearly so important as it was a few years ago; indeed, there are many physicians and surgeons, especially the latter, who confine their medical prescriptions almost exclusively to an occasional placebo or to a quieting potion following some severe surgical procedure. In the medical department many of the foremost practitioners, having turned their attention to metabolism and to the modern view-point of the nature, etiology, and cure of disease, rely almost wholly upon the dietary for their results, with such aids as they may receive from a careful direction of the habits, rest, and exercise of the patient, and some form of mental suggestion. In the maternity department medicines are very little used, with the exception of an occasional aperient or some outward application in the case of the mother, and, so far as the baby is concerned, if the institution could be entirely free from medicine of every sort the newborn baby would probably fare better.

In the children's department diet has come to take the place almost exclusively of the medication of a former day. Milk and milk formulæ, cereals, and soft diets generally are the treatment that are relied on almost exclusively by the modern pediatrician. Again, the great drug houses and chemical manufactories are compounding tablets, pills, and quasi-proprietary medicines of such accurate value that the former necessity to make up these prescriptions in the pharmacy of the institution no longer exists.

And yet every hospital and similar institution must have a drug supply and a place in which to dispense the drugs, and a few pertinent questions arise concerning the equipment and conduct of this necessary feature.

Where in the institution shall the drug store be? Shall the medicines be dispensed directly to the patients from the main drug store or from auxiliary medicine cabinets on the floors? What fixtures shall be used in the drug store—what kind of medicine containers? What kind of labels shall be used in the drug store and in the medicine cabinets on the floors? What shall be the extent of the drug supply? Must large quantities of medicines be bought and kept, or small? If medicines are kept in cabinets on the floors and adjacent to the wards, must these auxiliary supplies be large or small in variety? These are some of the questions that present themselves.

Without much reference to the order in which these questions have come up, let us discuss them briefly. In the first place, the generosity of the drug supply will depend on a number of things, as, for instance, the character of the institution, the kind and variety of its work. If there are a great number of departments, or especially if there are a great number of medical men attending the institution, it will be necessary to carry a considerable drug stock, because it is almost impossible to get medical men to agree on the dosage and forms of medicine they are to use. This question is vastly simplified if the institution is a public one, where there is a good deal of sameness in the character of the diseases treated. Sometimes in such a case a few formulæ can be employed, and the whole medication of the institution confined within the bounds of a dozen prescriptions, put up in large quantities, and dispensed by numbers on the bottles. It is not the staple medicines that

cost the money in the institution drug store of to-day; it is the vast variety of proprietary medicines that must be bought for individual cases to please the doctor who has a private patient on his hands. Oftentimes we must pay seventy-five cents or a dollar, sometimes four or five times that amount, for a sealed package out of which one or a very few doses are used. And this question of whether a large or small stock of drugs must be kept is dependent very much on the location of the institution. If it is in a large city or near a wholesale drug house, where an emergency medicine can be had quickly, the variety of the stock necessary to be kept will be very greatly simplified. There is the ethical question also that must be settled before we can undertake to determine the extent of the stock to be kept, and it is whether or not the attending physicians in the institution shall be allowed to have entire freedom in their prescription writing. A physician can almost break up an institution, if he has considerable practice there, and allows his fancy to run riot in the way of medicines. On the other hand, who shall say whether the ingredients in a given prescription are simply a fad on the part of the doctor or are actually necessary to the well being of the patient? Just here there seems to be the greatest possible need that the medical staff shall work in harmony with the necessities of institution economies, and where this harmony exists there will hardly come a question as to whether or not the doctor may have the medicines he prescribes.

Then the next question is, What quantities of a staple medicine, such as glycerin, quinin, carbolic acid, castor oil, linseed oil, flaxseed meal, and the like, are to be kept? There are two phases of this question. The first concerns the keeping quality of the medicines. If, for instance, it is glycerin, that can be very well kept if propery contained; one may lay in a large supply occasionally. There are other medicines, however, that must be purchased in very small quantities, as needed, such, for instance, as hydrocyanic acid, apomorphin, and all its salts and preparations, and nitrate of silver, crystals or molded. There will often come an occasion such as this—a physician will prescribe half a dram of a certain medicine that must be bought in a sealed package costing, say, $5 a pound, and it will be necessary to purchase the whole package or to pay 25 cents for a dram. The question comes up which is the more economic. Undoubtedly, if the medicine is one which is very rarely employed, or likely to spoil in keeping, it will be more economic to pay 25 cents for the amount actually required than to buy a whole unbroken package, which may never be used again or kept beyond its keeping power before it is called for.

Oftentimes the druggist of the institution will be warned by his wholesale house that a certain article is going to presently advance, as, for instance, when the law went into effect in this country prohibiting the adulteration of glycerin, immediately the price of glycerin almost doubled. Many institution pharmacists take advantage of the certainty of the advance in price and lay in a large supply. There will frequently be like periods in regard to other drugs, and the institution will have an opportunity to lay in a large supply at sometimes one-half the price they would have to pay a little later. If it is a drug that will keep well, of course it will pay to lay in the larger amount.

These main thoughts will probably suffice as to the drug supply itself. Let us now consider the fixtures in the drug store. Glass and metal and marble make beautiful fixtures for a drug store, and if they be supplemented with a white tiled floor we have a most attractive room. But, in the interest of the greatest usefulness, we must forego the question of ornamentation that would be secured in these pretty fixtures. A drug store is a place of bottles, and bottles break easily when

coming in violent contact with metal or marble or other glass, and it may be questioned whether the clean look of this metal and marble furnished drug store is actual or apparent. There is no doubt that many acids stain marbles and corrode metals, and it will not be very long before the drug store that started out so beautiful will be a place of spots and stains, and, where glass shelving and marble tables are employed, the metal screws and rivets and other fastenings will loosen eventually, especially those parts that come in jarring distance of the work counter, where the mortar and pestle are used and where unguents are rubbed up. On the other hand, well-seasoned, substantial wood fixtures, well painted and varnished, will keep in good order for a long time, and they can then be repainted and revarnished to make them as good as new, and there are very few medicines and even acids that damage wood as much as they do metal and marble, so that wooden fixtures in a drug store, and even the tops of the work tables and counters, will last longer and look better if made of birch or maple. And the same will be true of the flooring; tile is very pretty when new, but is easily stained by certain drugs, and the expensiveness of a concrete floor is not told in its first cost, but rather in the tremendous breakage, due to falling bottles, glass stoppers, glass utensils, and the like.

The next question that will present itself is the labels for the bottles, not only for the drug store, but for the medicine cabinets on the floors. This looks to be rather a trivial matter, but frequently the cost of labeling the bottles in an institution runs up into many hundreds of dollars if the work is done in a permanent and attractive manner.

Ground stoppered glass bottles, with etched or glass labels, and properly labeled ointment pots cost on an average about 40 cents each, or, for the hundred articles that go into each floor cabinet, about $60. In some hospitals gum labels with paraffin covering are used, or even the plain gummed labels, without any protective covering at all. For laboratories, or when only one or two careful, scientific men are to handle them, this may be sufficient, untidy as it is, but where bottles must be handled by undergraduate nurses who change frequently, and when a mistake in the reading of a blurred label may spell the death of a patient, it will not do at all.

The next question that will arise concerns the dispensing of medicines to the patients; that is, the character and location of auxiliary medicine cabinets about the institution. Some few years ago a hospital architect somewhere designed a medicine cabinet that was most attractive. It was made of metal, set into the wall at a convenient location near the ward, or in some instances in the ward, and was made up of two compartments, with a marble slab 30 inches from the floor as the bottom of the cabinet; and the upper part was divided into two sections, one large, to contain the great bulk of the commoner medicines, and a small compartment with a separate door. The shelves in the cabinet were nearly a foot deep, and a great many medicines could be carried in the cabinet by setting the bottles several rows deep. The attractive feature of the whole arrangement was the lighting scheme. The small cabinet inside the larger one was supposed to contain alkaloids and poisons generally, and a red light, supposed to be the danger signal, was turned on automatically when the door was opened. A white light was turned on automatically when the double doors of the main cabinet were opened.

The marble slab at the bottom of the cabinet had a basin and faucet about the middle of it, with hot and cold water. The whole arrangement looked most attractive, and was one of the most deceptive things imaginable. The presence of the red light indicated, in the first place, that there was need of warning somebody presumably ignorant of the character of the drugs kept in the case, and the genius

who designed the apparatus probably expected patients to go there and help themselves to medicines. The depth of the cabinet, providing for several bottles deep, made the whole thing unusable, because, as a rule, nurses who want medicines cannot take the time to remove half a dozen bottles before they get the one they want, and, as a rule, the nurses will not even take the time to see if the medicines are in the cabinet; they will order new ones from the main drug supply, so that it can well happen that there will be three or four different bottles of a certain medi-

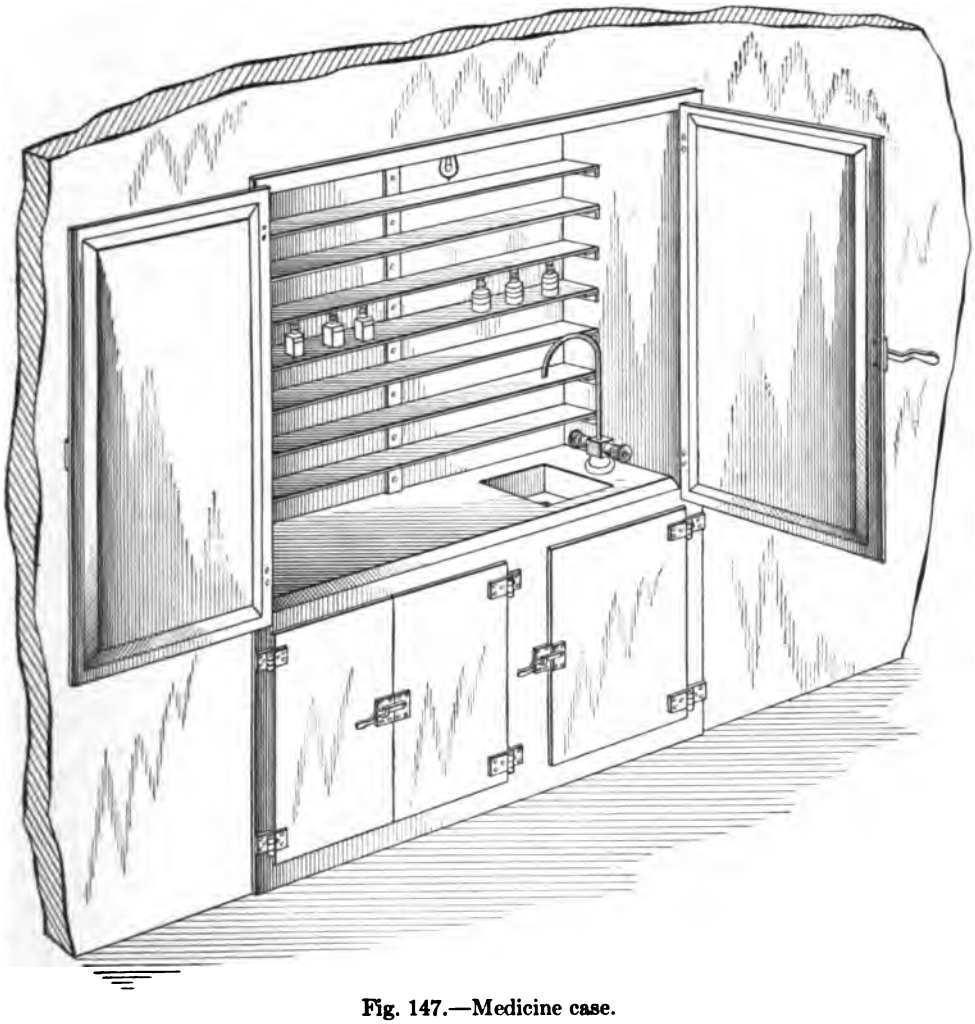


Fig. 147.—Medicine case.

cine in the cabinet at the same time. The glass shelves of the cabinet reached out to the outer edge of the marble slab, placed there for the purpose of being used as a work table to hold the medicine trays, and the fact that these shelves project over so far makes the marble slab unavailable for use. Fig. 147 shows a different sort of medicine cabinet. This cabinet was designed for the Michael Reese Hospital. The illustration is good enough to show all the details of the cabinet, and it will, therefore, need no description. The only light in the cabinet, and the only

light needed, is a white light set into the top. The shelves are 4 inches deep, and will hold only one bottle in depth. The sink and basin are off to one side of the marble work slab, and the slab is 16 inches deep, leaving plenty of space to set the medicine trays. The space under the work slab is made up of shelves on one side and a cupboard on the other. This cabinet has been adopted in a large number of hospitals, and it is giving perfect satisfaction.

We may go out of our way here just long enough to suggest that these medicine cabinets should never be in the wards, except in children's hospitals or wards, in which case it is necessary for the nurse to be always in sight of the patients; then the cabinet should be kept locked or closed with an automatic fastener. Many of us can remember the time when each patient's medicine was kept on a small table at his bedside, and he was expected to take his medicine without bothering the nurse about it. This will not do any longer, because patients are wholly irresponsible regarding their own necessities; therefore, in every well-regulated institution there are medicine nurses, and patients are never permitted to handle either their own or other patients' medicines; indeed, many patients have committeed suicide by the ease with which they could get poisonous medicines, and many patients have lost their lives through the irresponsibility of other patients who undertook to dose out the medicine to them. If it is a very small hospital, or a very small floor or ward, it will not take very long for the nurse to get round periodically to give patients their medicines, and, if it is a large area to be covered and a large number of patients to be served, there ought to be a nurse charged with the responsibility and detailed for the purpose of giving medicines. There is a good deal to be said on the question of the location of medicine cabinets, the responsibility resting upon the hospital in the matter of giving medicines to patients, and the care and technic with which medicines should be given.

Modern medicine has brought into use many serums, antitoxins, and vaccines, and these things need to be kept at certain low but regular temperatures if they are to be relied upon, and this makes it necessary to have an accurately controlled refrigerator in or very near the drug room. If the temperature is permitted to run too low these biologic preparations will be destroyed, and if it is allowed to go too high they will be destroyed even more quickly; about 40° F. is usually considered the best temperature, but it must not be allowed to vary. In large institutions these goods may be kept in the refrigerators of the laboratory of pathology, but they are better kept with the drug supply, so they will not be likely to be mistaken for other things in the laboratory refrigerator not intended for patients.

HOSPITAL DIETETICS

THERE are, or should be, three chemists' shops in every hospital. One is the drug store, in which prescriptions for medicine are compounded; the second is the milk laboratory, in which prescriptions for milk are compounded, especially for sick children; and the third is the diet kitchen.

Of these three, undoubtedly the department of dietetics is the most important, because medicines are becoming less a factor in the care of the sick, and, in any event, their preparation is a thoroughly settled profession; and, in a final analysis the sick children could be fed on mothers' milk, or pure fresh cows' milk, or the milk of some other animal, like the goat. But the dietary for the adult has become of vast importance in the treatment of disease, and many of the great medical men of the day are almost confining themselves in the treatment of disease to physical and dietetic therapy.

It is no concern of the hospital administrator what diet is prescribed, but it does concern him that the doctor shall have for his patient precisely what he orders in the way of a diet.

In nearly all institutions there are prescribed diets, as, for instance, a non-nitrogenous diet, a diabetic diet, a salt-free diet, and so on, and these printed diet lists are usually hung in conspicuous places in the kitchens and serving rooms, and every patient in the institution will be fed according to one or the other of them.

The unfortunate thing about our attempts to administer an efficient dietary in an institution is that the principles of biology and physiology and the science of dietetics are themselves in an evolutionary stage, and the doctors do not agree; and, still more unfortunately, some of the doctors when they prescribe, for instance, a non-nitrogenous diet, expect the patient to be fed on food that contains no nitrogen; manifestly, this is impossible, because all food materials contain nitrogen or the making of nitrogen. These same doctors who prescribe a diabetic diet expect their patients to have a diet entirely free from sugar; this, again, is impossible, because all diets contain sugar or some sugar-former to a certain extent. The diet lists of all hospitals, therefore, are merely relative, and are confined to such articles of food as contain a minimum of the interdicted constituent, whatever that may be. Furthermore, the manner of preparation of foods plays an important part in the availability of their nutritive constituents—that is to say, in the cooking of meats the temperature may be brought to so high a point that the proteins will be coagulated past the possibility of breaking up, and will thus be lost as an available nutriment; the carbohydrates may not be sufficiently cooked to soften the intercellular tissue, so that the digestive agents can reach the actual value within to make that available. Again, new chemic compounds are sometimes formed in the processes of cooking, and these may be important factors to aid or retard digestion. So it will not do to prescribe foods taking their chemic ratios for granted, as we do in medicines from the pharmacy; we must look very much further ahead, to determine not only what the particular food is, but all its chemic and physiologic value.

It is a peculiar fact that, while medical science has progressed tremendously in the fields of metabolism, and has reversed many beliefs of a former day, we still employ those sacred diet lists that were revered twenty years ago. Not only that,

while the laboratory of to-day has placed on record a distinct recognition of vast differences between individuals in the matter of food assimilability, we, in the clinics, go along prescribing three or four diets, as though all individuals were alike, and there were only three or four diseases in the world. In a fortunately long-forgotten day every hospital had its half-dozen gallon bottles of formulæ on the shelves of the pharmacy, and it was a rare case and a brave doctor that needed to go outside of that precious coterie of nostrums. That isn't quite true to-day; prescriptions are written and compounded for individuals, not classes, and to meet the actual conditions of the particular case, and not to meet the requirements of a type.

CALORIC VALUES IN DIET

Nearly all doctors who practice in our institutions know, in a general way, that a full diet for a well person at hard work means about 3000 calories daily when chemically analyzed; that a well person not at work can live on considerably fewer calories, and these caloric values are figured out with a pretty general uniformity for sick people of various ages and suffering from various diseases, and if we could feed our patients indiscriminately in calories, according to the doctor's orders, the question of hospital dietetics would be reduced to its simplest form. But digestion is to a great extent a process of oxidation; one person may be capable of oxidizing and assimilating food material much more completely than another; most certainly this ability is affected by manner of living, age, occupation, physical condition, habits, and constitutional peculiarities. Again, even a well person will not require the same number of calories at different seasons of the year, or in performing different kinds of labor, or in different environment; so that, no hard-and-fast rule can be laid down for measuring foods in calories, even in conditions of health, how much less so in varying conditions of disease? Moreover, caloric values take no account of interdicted chemic constituents of food, except in a very limited degree, and if a physician undertook to feed his diabetic patient in calories the hospital diet kitchen might make up a large percentage of the prescribed allowance in a sugar-bearing food. If, on the other hand, we take the remaining horn of the dilemma, and undertake to select a diet for any case or for a class of cases by the thumb-rule method of printed diet lists, we must ignore entirely the part that individuality plays, and depart quite as far from a scientific basis as though we had taken the route of the calories.

If, therefore, we, as hospital caterers to the medical profession, undertake to invade the realms of physiology and chemistry in the conduct of our dietary, we find ourselves under the necessity of reckoning with each physician in the institution in a different way, and of becoming involved in a difficult maze of chemistry and physiology and figures with each individual patient; it is manifestly impossible to do this; it is also quite unnecessary.

It is the doctor's business to prescribe medicine for his patient, and quite as much so to prescribe a diet. The hospital will be delivering all that can possibly be expected of it if it carries out faithfully and intelligently the doctor's orders. It is well enough to have diet lists, because there are a great many physicians who will not take the trouble or time to prescribe a scientific diet, and there are many who do not know what a scientific diet is. We shall have occasion to use the thumb-rule diet lists with many practitioners, but there are a few scientific men in every community who do know what they want in the way of diet, and whose results in the feeding of the sick entirely justify us in making every effort to carry out their orders.

This brings us to the middle, and undoubtedly the straight and narrow way that leads to the future of scientific diet, the individual prescription for the individual case, and thus we come back to our starting-point, that most important of all chemists' shops, the diet kitchen.

The main question is, How shall we create a system that will prove efficient in serving a special diet to every patient in the hospital who needs it, and precisely according to the doctors' orders, continued over any period of time that it may be required? The answer deals entirely with the personnel of the diet kitchen.

THE ORGANIZATION OF THE DIET KITCHEN

It makes no difference whatever whether all the food is cooked in the large hospital kitchen, or whether the staple articles are cooked there and the special articles prepared in the diet kitchen, or whether all of the food shall be bought for,

Michael Reese Hospital

Special Diet Record

Admission No.———

Name Physician

Location Interne

Date of Admission Special or Floor Nurse

Diagnosis Special Diet Nurse

Special Diet for 191

BREAKFAST

ARTICLE	How Served	Quantity	Quantity Returned	Quantity Consumed	Protein	Carbo-Hydrates	Fats	Salts	Fluids	Calories	Remarks
TOTALS											

DINNER

Fig. 148.

sent to, and cooked in the diet kitchen. These things are all of economic value only. The technic of the serving department is the essential thing. In the very few institutions in this country that really aspire to a scientific dietary the various classes of diets are distributed among the persons employed to prepare the trays, and these persons are held to a strict accountability for what goes on them. This presupposes, of course, that the hospital discipline is rigid enough to maintain inviolate a tray that has been prepared in the diet kitchen until it reaches the patient for whom it is intended. For instance, all diabetic trays will be assigned to one nurse at work in the diet kitchen. When a doctor prescribes a diet in detail for his patient, she will merely fill the prescription and prepare the tray down to the last teaspoon, to say nothing of every item of food. In cases of patients whose physicians merely prescribe a diabetic diet, she will prepare the meal composed entirely of articles taken from the diabetic list at hand. Each tray, when completed, contains the name of the patient and his bed number or room number, and the tray will

not again be added to or subtracted from in the slightest particular until it reaches the patient. This naturally presupposes a prompt service in the transportation of trays from the kitchen to the patient, else, however satisfactory the tray may be from a scientific standpoint, it will reach the patient cold and in bad order, will be unappetizing, and the patient will not eat the food. Nor is it sufficient that we get the prescribed meal to the patient in an attractive condition, every article carefully weighed down to the gram or even grain; our part is not completed until the tray is returned to the nurse who set it, and who is now to weigh back every particle of the "left-overs," and enter the total actually consumed in the nursing or diet record of the day. However important or unimportant the old diet list may be, the conveniently arranged diet slip, that will permit a quick and comprehensive setting

Admission No. 44100 HOSPITAL

Name..... Ward..... Room..... SPECIAL DIABETES CHART

DECEMBER 1910	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
FOOD															
MEAT	250														
EGGS	200														
VEGETABLES	300			2700	2374										
BUTTER	150														
BREAD	75														
POTATOES															
OAT GRUEL						600									
PROTEIN	74.7			54		36									
FAT	186.6			8.1		276									
CARB'TE	49.7			102.6		165									
NITROGEN	11.9			8.6		6.0									
CALORIES	2246			717		3393									
URINE															
AMOUNT	2400			2730		2360									
SPEC. GRAV.	1040			1030		1022									
SUGAR %	2.2			2.7		.82									
SUGAR GMS.	53			73.7		19.3									
ACETONE	+			++		++									
DIACETIC AC	+			++		++									
AMMONIA	1.7			1.97		.80									
NITROGEN	16.7			16.5		8.26									
AMMONIA NITROGEN	0.10			0.12		.09									
PAT'S WEIGHT	113			109		111									

Fig. 149.—Method of keeping daily summary.

down of just what the nurse has done under this order of things, is a necessity; such a slip is reproduced as an example of such a form (Fig. 148).

Repeat for dinner and supper on same sheet.

For chemic values of food articles the Atwater tables, published by the Agricultural Department of the Government, will be found sufficiently accurate for all practical purposes.

In connection with this feeding chart there is used in the Michael Reese Hospital another chart for carrying out the day's summary, in other words, the patient's story of the day. The chart used is one shown elsewhere under the subject of Record of Patients. Figure 149 shows one instance of how this chart is used in this connection. The data can be varied according to the particular case, and must, in any event, be an individual matter. We may incorporate here

any blood examinations that may be required, blood-pressures, and whatever information that may be wanted from day to day.

There are some institutions in which no pretense is made, or, from the very nature of things, no pretense can possibly be effectively made, to conduct anything like a scientific dietary. However, even the more modest hospital must furnish a special diet of a simple sort for patients that require it, according to the laws laid down by the great mass of modern physicians. There are not many of these diets, and we give them below, not in endorsement of them as a sufficient answer to the demands of the modern physician who is capable of specializing in metabolism, but for the benefit of the great mass of general practitioners who have neither the time nor disposition, even if they had the special training, to order a more carefully arranged diet:

Fluid Diet

1. Milk and foods derived from:
   (*a*) Kouniss.
   (*b*) Buttermilk.
   (*c*) Whey.
   (*d*) Modified milk—barley, H_2O; limewater.
2. Broths.
3. Gruels.
4. Beef-juice.
5. Beef-tea.
6. Cocoa—hot or iced.
7. Tea—hot or iced.
8. Coffee.
9. Fruit beverages:
   (*a*) Orangeade.
   (*b*) Lemonade.
   (*c*) Grape juice.
   (*d*) Blackberry cordial (home made).
   (*e*) Sangarees.
10. Barley and Rice, H_2O.
11. Albumin drinks:
   (*a*) Milk.
   (*b*) Water.
12. Cream soups.
13. Egg-nog.
14. Frozen desserts.
15. Fruit sangaree.

Light Soft Diet

In addition to the fluid diet:

1. Well-cooked cereals.
2. Purée.
3. Milk-toast.
4. Junket.
5. Soft custards.
6. Soft poached or boiled eggs.
7. Gelatins made of sherry, fruit-juice, etc.
8. Raw beef sandwiches.
9. Oranges—juice only.

Soft Diet

(In Addition to Diet Lists I and II)

1. Eggs in any way except fried (be sure hard cooked, do not reach boiling-point).
2. Soups.
3. Oysters.
4. Steak.
5. Creamed chipped beef.
6. Fish—baked or broiled.
7. Creamed celery.
8. Crackers and wafers.
9. Baked apples.
10. Stewed fruits.
11. Oranges.
12. Grapes.
13. Chicken.
14. Squab.
15. Sweetbreads.
16. Quail.

Strict Diabetic Diet

Meats or poultry of all kinds prepared without flour, bread-crumbs, etc. Eggs and cheese of all kinds.

Fish prepared in any way excepting with milk or flour.

Fats of all kinds, in the form of cream, butter, bacon, olive oil, salad dressings, etc. Plenty of cream should be used for cooking.

Vegetables: Lettuce, cress, celery, tomatoes, young green beans, onions, radishes, asparagus, Brussels sprouts, rhubarb, cauliflower, artichokes, spinach, cabbage, mushrooms, pickles, sauer-kraut, olives.

Soups made of meat or extracts with egg or any of the above vegetables.

Desserts prepared from eggs, cream, gelatin sweetened with saccharin, instead of sugar and flavored with vanilla, coffee, almonds, etc.

Stewed rhubarb or gooseberries sweetened with saccharin.

Nuts of any kind excepting chestnuts.

Beverages: Water, mineral waters, tea, coffee (with saccharin in place of sugar), occasionally a little cocoa; lemonade sweetened with saccharin or glycerin; buttermilk in moderate quantities (?).

Everything not expressly mentioned above is forbidden.

Diet Low in Albumin

(So-called "Nitrogen-free Diet")

Fruits of all kinds—fresh or stewed.

Potatoes, carrots, cabbage, cauliflower, spinach, sauerkraut, asparagus, radishes, lettuce, cucumbers, tomatoes, mushrooms.

Fats of all kinds—butter, cream, olive oil on salad dressing or in mayonnaise, lard—sugar in abundance.

Bran bread and moderate amounts of wheat bread. Toast, zwieback, sweet crackers.

Beverages—water, claret, sweet wines or liquors. Small amounts of milk or buttermilk.

In the Michael Reese Hospital, where at least a serious attempt is made to conduct a dietary along these suggested lines, the established order of procedure is about as follows:

Most of the staple articles of food for the special diet patients are cooked in the main kitchen, such as clear soups, roasts, potatoes (baked, boiled, or mashed), the commoner vegetables, such as beans, peas, corn and tomatoes, and perhaps the dessert of the day. The diet kitchen cooks its meats, broils or bakes its own birds, makes its own cream soups, because cream soup is an article that cannot be prepared in large quantities advantageously, prepares its own salads, and makes its own jellies and custards.

The diet kitchen requisitions the staple foods that it may need from the main kitchen, and these are sent in in ample time for the making up of trays, and placed in a steam table maintained for the purpose. The trays are made up from these foods, each nurse at work in the diet kitchen preparing the trays for which she is to be held responsible. It is a part of the training to know just at what minute a certain food may be set on the stove to cook, or placed on the tray to serve, and the exactness and efficiency of the training will determine the condition of the food when it reaches the patient. When ready, the food is transported immediately from the diet kitchen by dumb-waiter on the trays, as expeditiously as the discipline of the hospital provides, to the patient for whom it is intended.

If this system is conscientiously and rigidly carried out, and if delinquent or inefficient nurses are disciplined whenever something goes wrong in their department, there will soon come a routine of service that will meet at least most requirements of the medical profession, and if this system is carried out, and a patient, for instance, that is under treatment for diabetes has a "run-up" of sugar, the hospital administration and diet kitchen will be held blameless.

In regard to the nurses and their responsibility, it is the experience in the Michael Reese Hospital that, when the nurses are kept in touch with the progress of the patients they are serving, they will take the most lively interest in their work, and will strive conscientiously to get results, and records that show improvement mean as much to them as they can mean to the doctor.

This dietetic rigidity can be aided very materially if, instead of the ordinary tray for the preparation and transportation of food, there is employed some such individual serving steamer as that indicated under the section on Equipment of the Serving Rooms. This little individual server performs a twofold duty for this purpose; it not only keeps the food hot and in very excellent condition for the patient; it not only, by reason of its coverings, minimizes the likelihood of some article being added to or taken from it in transit, but, because of its very individualism, there is impressed upon the mind of the nurse the importance of care in its preparation; in other words, it looks formidable to the nurse; it is different from the ordinary tray, and the nurse will soon learn to respect that difference, and to respect the sanctity of these special trays.

The nurses are taught, as a part of their diet-kitchen training, the chief food

value of all the articles used in their department, why they are used, and what the results will be to the patient if other foods are used, so that they have an actual working knowledge of what they are doing. They are required to make out their own ménus from day to day in the cases not specifically prescribed for by the physicians, and it is a further part of the training to defend their ménus in class. After a time the pupil nurse finds the problem of weighing out and compounding her own prescriptions a most fascinating one, and her own failures, as evidenced in the records of her patients, are the most acute punishment she can receive for careless or poor judgment.

SPECIAL DIET IN THE SMALL HOSPITAL

The small, economically administered institution cannot afford a very elaborate equipment or a large corps of people to conduct the diet kitchen, nor is this necessary.

Very much good work can be done if the organization is compact and the routine well arranged. In many institutions there is a disposition to complicate the technic everywhere, including the dietary, by division into too many units—too many avenues of transportation, too many serving rooms, and too many peoples' fingers in too many things.

In a hospital of, say, 50 beds, there will hardly be more than ten special diets—at least special enough to be dignified by that term. One person, even an undergraduate senior nurse, can make up that many trays, with what food she can prepare specially added to what she can obtain from the main kitchen, and there ought not be any great difficulty about getting that many trays directly to the patients, even if they have to be carried one at a time by an orderly or maid if a nurse is not available.

Where such a practice is attempted, the really essential thing is plenty of room for the diet nurse. She ought to have a quick-acting, roomy gas range with toasting and broiling compartments; a good and conveniently arranged steam table and plenty of shelf room. It will be wholly impossible for a nurse or anyone to gather up food here and there in the main kitchen, and assemble it in some out-of-the-way corner, and, if she is required to do so, she will soon become quite as careless and negligent as was the superintendent who prescribed such a routine practice.

MILK IN THE HOSPITAL

It must be recognized by all hospital and institution administrators that the use and care of milk are among the most important features of food management. This would not be true if it were possible for institutions to own their own herds and to milk their stock under hygienic and clean conditions, but that is not the case usually, and it is growing less possible every day, owing largely to increased prices of land and the necessity to operate institutions in close proximity to largely populated districts in which land values are practically prohibitive for agricultural purposes. State institutions, asylums, sanitoriums, orphanages, and "homes" for the aged, for children, and for defectives are exceptions to this rule, because candidates for admission to these institutions are not acutely sick, and may be transported out into the country where ideal conditions for their care are to be found. Even hospitals for acute diseases, in the smaller cities and towns, may sometimes be located just outside the populous area, where land is not high priced. Such institutions may and should own their own farms and produce very substantial proportions of their food supplies, including, in any event, poultry and dairy products. But in the metropolitan hospitals the milk problem is becoming more acute and annoying year by year, not the least important factor in which is the ever-growing arrogance, greed, and dishonesty of the milk trusts. These iniquitous corporations, trafficking as they do shamelessly in the lives of children and infants, have reached a point where they have representation in nearly every legislative body and astute lawyers in every court. They have set their tentacles into every farm in the land, and have so arranged matters in many places that if a farmer dares to sell to the consumer they are enabled to shut his milk out of the market on some flimsy pretext; in some cities they have strength to defy the health authorities, and even go so far as to attack the personal character and integrity of sworn officers of the law, men who have the interests of the people at heart and whom the people implicitly trust. These corporations have gone even farther, and in one city at least on one occasion they made common cause with a labor union to prevent the delivery of milk to a charity hospital in order to enforce their monopoly.

During the winter of 1910–11 in the Middle West these companies charged from 22 to 24 cents per gallon for a most indifferent quality of milk as to age, bacterial count, and cleanliness, when the farmers were being paid 12 cents or less. It is this condition that has brought the milk question for institutions into the forefront as a most vital and pressing one. A few institutions, hotels, hospitals, and the like have settled the question for themselves by buying farms at nearby points in the country, with railway delivery points convenient both to the farm and the institution; and these institutions are profiting by the experiment in the quality, cleanliness, and price of their milk. The starting-point in all these innovations has been the underlying belief that if the average farmer of the country, unscientific and extravagant in his methods, can produce milk and do well enough to even live and remain in the business at a price of 3 or 4 cents per quart, why cannot an efficiently conducted dairy enterprise, operated on proper economic lines, do the same, or, at the very least, do well enough to produce clean milk, have it delivered promptly, and save at least a part of the middleman's profit.

The great majority of institutions, however, have no such settlement of the perplexing question in sight, and must solve the problem in some way with conditions as they are.

A great many cities are very properly compelling the pasteurization of the public milk supply as the least harmful horn of an almost hopeless dilemma; it is either that or disease germs and filth. If private families had facilities, knowledge, and initiative sufficient to pasteurize their own milk, it would be better for sanitary bureaus to allow the delivery of raw milk even if it was bad, but the public must be protected against its own ignorance and incapacity; hence the milk is pasteurized in a makeshift way, and if the toxins are left to work out their damage to helpless infants at least some of the pathogenic bacteria are destroyed. The average institution is not quite so helpless as the balance of the public, because it is always possible to operate a milk laboratory in connection with the institution. When this is done, the unsanitary and disadvantageous conditions under which milk is furnished can be to a very large extent discounted.

No one who understands the subject will propose the pasteurization of milk, provided it can be controlled from the time it leaves the cow until it reaches the consumer. Indeed, it is merely the best of a bad bargain which the exponents of pasteurization urge, and pasteurization will cease of its own accord whenever good milk can be supplied raw, fresh, and clean.

TREATMENT OF MILK

In approaching the subject of milk handling for institutions we may recognize two, or perhaps better still, three forms of the commodity.

The first, and by far the most important on the score of quality, is the milk for infants; second, milk for the diet of sick adults; third, the general supply for the hospital, for well people to drink, and for cooking purposes. Naturally, there can be no compromise in milk for sick children. A vast majority of the ills of infancy are gastro-intestinal; old milk is almost as harmful pasteurized as raw, and often more so, because while the pasteurization may destroy all pathogenic microorganisms, the toxins, the product of these, have been retained, although no microscope will develop their presence, so that the evil is hidden and oftentimes unsuspected. Moreover, in the ordinary commercial way of pasteurization with the so-called "flash" method, uneven and incomplete as it is, some particles will be actually cooked: and this cooking serves to coagulate the lacto-albumins and fix the caseins, and thus create a food quite as indigestible in the gastro-intestinal mechanism of a sick baby as the hard-boiled white of egg; other particles of the milk run the gauntlet of the conic toboggan and their micro-organic inhabitants escape even a setback to their activities; then when such milk is allowed to rest after the process, more especially if the temperature is not very low, these pathogenic bacteria find lodgment in the cooked particles (than which there is no better culture-medium), because the normal ferments in the shape of lactic acid bacteria have been destroyed and the original power of resistance of the milk has been lost. Administrators of children's hospitals, or general hospitals in which there is a children's department, realize the impossibility of using any but fresh raw milk in the feeding of sick infants suffering from "summer complaint" or "enteric fever," or any of those classes of disease referable to the stomach and intestines.

When the amount needed for the sick children is small, sometimes one or a few cows may be kept close by, and the milking may be controlled as to cleanliness, and the milk used fresh, or made up into whatever formula the attending pedia-

trician may prescribe. There are some institutions that make a special contract for the children's department, and pay the added price to insure its prompt delivery raw from even considerable distances in the country, especially if there is a railway milk service convenient.

CERTIFIED MILK

Those who have given the matter greatest study are very loathe to take the so-called certified milks on faith. Most of these certified milks are not what they are sold for. The pretense is that they are fresh, raw, cleanly drawn, and hygienically handled, but most of them are prepared milks. As a rule the certified milk is separated from its cream; enough additional cream is added to bring up the butter-fat content to 4 per cent. or whatever the commodity is sold at; and the milk and cream are again mixed, so that the precise contract as to quality can be complied with. If this separation and remixing were done on scientific principles there would be no harm in the process, but unfortunately this is rarely the case.

We hear and read a good deal lately about "Holstein" milk for sick children, and there is a reason for this which it might be profitable for us to follow briefly. The Michael Reese Hospital went very exhaustively into the question of milk for sick children recently, and when it came to a study of cows' milk, an inquiry was made into the various breeds of cows with reference to the quality and physiologic value of milk; and it was found, for instance, that many of the most famous Jerseys could not raise their own calves, and that the beef-cattle breeders were in the habit of taking the calves away from the highly bred shorthorns and other beef strains, and giving the calves to scrub or "thin milk" cows, like the Holsteins and Ayrshires. The greater value of the mothers for other purposes was urged as a reason for this foster-mother or wet-nurse practice, but several scientific breeders were willing to admit that the calves seemed to do better on thin milk.

The butter-fat globule of the Alderney, Jersey, and Guernsey milk is very much larger than that of the scrub or thin milk varieties, and the shorthorn is a close second in the size of the globule. It is believed by those who made the experiments that the size of this fat globule has a great deal to do with the digestibility of the milk, though not enough experimental work has yet been done to prove this to be the case. If this is true, then it goes without saying that the custom of adding cream to certified milk to bring it up to the charmed "4 per cent." so anxiously sought by milk buyers, is a most pernicious one, because these certified milk people are accustomed to keep enough Jersey cows to furnish the required balance. Most Holstein and other thin milk cows do not give a 4 per cent. milk, and many of them do not go as high as 3 per cent., but it seems from the experiments above alluded to that the thinner the milk, the smaller the fat globule. In the same set of experiments the fat globule of the human milk was found to be smaller than that of any other animal; that of the ass came second, and the milk of the ass has long been used, where that animal is common, for feeding sick babies; the goat came third in respect of the smallness of the globule, and goats' milk for infants' feeding has long been recognized as an excellent substitute for mothers' milk.

In view of these citations, speculative though they be to a certain extent, it would seem highly desirable to consider not alone those virtues in milk with which we are most familiar, and which are exploited as peculiar to certified milk, but to question other qualities in a milk when things go wrong in the children's service. Having obtained, then, the best milk possible for our sick children under existing circumstances, we bring it to the milk rooms of the institution ready for treatment in one of the many ways required by the children's doctors.

TREATMENT OF CHILDREN'S MILK

There are three steps in the handling of milk that must be provided for: first, pasteurization; second, sterilization; third, formulation by prescription. Pasteurization is the most important because the most delicate of these necessities. At the present time there seems to be a single pasteurization mechanism offered for sale that is worth consideration. That in which the milk is supposedly pasteurized as it passes down a conically shaped heated surface is just a little the worst form of pasteurizer that could well be conceived. Usually these machines have a rope or scraper of some sort bearing upon the surface of the metallic cone for scraping the cooked milk particles away, so that other particles may reach the heated surface. The result is that some of the milk is actually cooked and some of it is not even heated. Other milk pasteurizers are essentially tanks in which the milk is heated

Fig. 150.—

in bulk; if this were done under careful
but it is never done under
found to be filled with manure and
and other vermin.

We must conclude that at the
milk is now efficiently
institutions must provide
for a hint as to the most
gentlemen, when they
laboratory purposes,
and perhaps the most
accomplished by
Agriculture. Dr.

accurate and exact results in the determination of the thermal death-point of the pathogenic bacteria, and his results may be taken as our guide, because in his pasteurization he accomplished the results for which we are contending, that is, the heat point and the time required for the destruction of the various forms of pathogenic or harmful bacteria, such as colon bacilli, the tubercle bacilli, dysentery, and typhoid, and it is really these bacteria that we are undertaking to kill.

Working upon the basis of Dr. Rosenau's technic, we have designed a pasteurizer in the Michael Reese Hospital on a scale that may be increased or diminished to

Fig. 151.—Ehrlenmeyer flasks with cork and tube.

meet the needs of a very small or a very large institution. Figure 150 shows this mechanism as it is operated. The cupboard in the lower part of the machine is merely to house the necessary flasks when not in use, the working part of the machine consisting of a reservoir of sufficient size into which opens a cold- and a hot-water pipe controlled by cocks. At the left of the machine steam coils are let into the bottom of the reservoir sufficient in number to heat the water rapidly. The admission of steam through these pipes is controlled by an ordinary Powers' automatic temperature regulator or a device of similar design. This temperature regulator is set to provide the temperature required. The milk containers are

ordinary 2-liter laboratory Ehrlenmeyer flasks such as those pictured in Fig. 151. These flasks are fitted with soft-rubber corks, one used as the control, the cork of which contains a standardized thermometer. The process of operation is one of thumb-rule. The possibilities of the machine having been tested, the method is to fill the reservoir with water; if the water is hot the temperature is more quickly reached; if the water is cold it will take longer to heat. Cold water is preferable if it is designed to continuously employ the control thermometer to indicate the stage of the process. These flasks filled with milk up to a definite point, and the rubber corks tightly fitted, are completely immersed in the water. Dr. Rosenau allowed the milk to reach the temperature of the water, which, for his purposes, was fixed at 60° C., 140° F., and he then maintained that temperature for twenty minutes. He found that with this heat all the pathogenic bacteria were destroyed, and that the milk itself was left chemically unaltered, that is, the lacto-albumins were not coagulated and the caseins were not fixed, as would have been the case if the temperature had gone higher or was maintained longer. It will not do to leave the corks of the flasks exposed above the surface of the water, because the bacteria on and under the corks will not have been reached by a sufficient degree of heat for a sufficient length of time to destroy them, and the milk is more than likely to be reinfected as it is poured from the flasks. Glass tubes in the corks allow for expansion under heat.

It is important to have a by-pass around the regulator, so that if a much higher temperature is required, as, for instance, in the complete sterilization of milk, the steam can be turned into the coils without the control of the automatic regulator. In this way milk may be boiled or brought up to any required temperature, always assuming that the control flask and the thermometer are in operation. It is not a difficult matter to determine for the working purposes of the milk operator, a nurse or other intelligent woman, just how long it will take for the milk in the flasks to arrive at the temperature of the water in the tank, given the number of flasks to be heated and the temperature of the water at the outset, and this technic should be established for the operator before she is entrusted with the work.

It was found in the Michael Reese Hospital that when the milk and air in the submerged flasks became heated there was sometimes sufficient expansion to blow the corks from the flasks, and to remedy this each rubber cork was fitted with a glass tube; in this way an escape was furnished for the expanding air or milk. Figure 151 shows this mechanism.

STERILIZATION AND FORMULÆ MILKS

The so-called lactic acid bacteria are hardier than any of the pathogenic microorganisms we have commonly to reckon with, and after Rosenau's process there are many of these harmless bacteria remaining alive, and subsequently their activities may be re-established and the milk go on to the physiologic processes of fermentation, and in those cases of disease where pasteurized milk is available this is a welcome culmination; there are many diseases and stages of disease, however, in which even so mild a fermentative process cannot be borne and in which the whole gastrointestinal tract is practically out of commission, and it becomes necessary to still further modify the feedings; this is done by resort to a species of predigestion in which a completely sterilized milk is employed as a basis to destroy every possible ferment, and in which the second stage of preparation is the addition, under certain conditions, of an artificial ferment in the form of a prepared rennet. It is not a difficult matter to sterilize milk in preparation for its formulation into prescriptions

for individual cases; it may be done in the pasteurizer by increasing the heat or, especially, by increasing the time. Care ought to be taken not to carry the heating too far, since there is danger of creating very radical changes in the chemistry of the milk and so destroying it altogether. Rosenau's process, using 140° F., carried for forty minutes after the milk has reached the desired temperature, is adequate. The cooling of milk after either pasteurization or sterilization should be accomplished as quickly as possible, with due regard to the breakage of the flasks. For this purpose a long trough with three or four compartments may be used: the first to contain warm water, the second to contain water of a considerably lower temperature, a third, of a still lower temperature, and if there is a fourth compartment, the water in it may be cold. Each of these compartments has a vent for the escape of the water after it has arrived at a height that will cover practically all the milk. After this cooling, the milk may be set in the refrigerator and kept for practically any period of time.

There are certain formulæ of milk employed in common by modern pediatricians, and since a discussion of their purposes and the avenues of their usefulness would bring us far into the realm of medicinal practice, we shall find it profitable to merely set down the commoner ones, with the laboratory notes for their dispensing:

Peptonized Milk

1 pint milk.

1 peptonizing tube or 3-grain tablet; mix in a little cold water and add to milk. Put in cold water-bath and bring to temperature of 120° F., allowing milk to stand for nine minutes. Place immediately on ice.

Kellar's Malt Soup

Take of wheat flour 2 ounces and add to it 11 ounces of milk. Soak the flour thoroughly and rub it through a strainer. Put into a second dish 20 ounces of water, to which add 3 ounces of malt extract; dissolve the above at a temperature of about 120° F. and then add 2½ drams of 11 per cent. potassium bicarbonate solution. Finally, mix all of the above ingredients and boil. This gives a food containing albuminoids, 2.0 per cent.; fat, 1.2 per cent.; carbohydrates, 12.1 per cent. There are in this mixture 0.9 per cent. of vegetable proteins.

Whey

Add to 1 pint of fresh lukewarm (98° F.) milk 1 teaspoonful of liquid rennet. Allow milk to stand in warm place until firmly coagulated. When the curd has formed, beat up with a fork and allow it to stand for some moments until the curds have shrunk considerably; strain off whey through cheese-cloth or silk; then heat whey to a temperature of 150° F., thus destroying further action of rennet.

Buttermilk Formula

First mix with a small amount of cold fresh buttermilk 40 grams or 2 ounces of wheat or barley flour; then add enough buttermilk to make 1 liter; gradually stir in 60 grams or 2 ounces of sugar and bring mixture to a boil; after it has boiled for twenty minutes, being stirred constantly, it is placed in ice-chest and warmed before feeding.

Directions for making up the formulæ or prescriptions are given in sufficient detail to enable almost any one to do the work intelligently, but we might say a word or two about the only formula that will ordinarily be open to glaring and costly mistakes in dispensing, and that is buttermilk. Doctors are prescribing buttermilk a great deal of late years under one name or another, and they seem not to go into the details, as a rule, about how it should be made. Most of us know that the buttermilk to be purchased of milk dealers is a by-product. If we did not buy it the pigs would get it, and the pigs do get a great deal of it. The buttermilk bought from the delivery wagons is about the filthiest stuff imaginable; the bacteria

it contains are of every known kind, harmless and pathogenic; its toxins are inestimable and its physical condition is an abominable nondescript, quite as dangerous in the gastro-intestinal tract of a sick child as a dynamite cracker with a slow fuse lighted.

Buttermilk can be made, however, that is good—not only good for the children in view of their condition, but good to drink from the standpoint of palatability. The secret of the process is to start out with the proper artificial lactic acid bacteria. For a long time the physiologic chemists and, behind them, the wholesale drug houses have been trying to obtain an artificial milk ripener that would leave the buttermilk with a sweet and palatable taste instead of the acutely bitter after-taste so common. The only ferment that seems to the author to have overcome this serious objection is Hansen's Lactic Ferment, to be purchased in all the wholesale houses.

A so-called starter or yeast is made and kept going from week to week, under directions accompanying the package. The milk is sterilized to rid it of all extraneous ferments and pathogenic bacteria, and treated in the way prescribed in the directions. The milk may be used whole, churned after it has been ripened and the butter used sweet for the salt-less diet cases in the adult parts of the institution, or the milk may be separated before ripening and the cream used for other purposes.

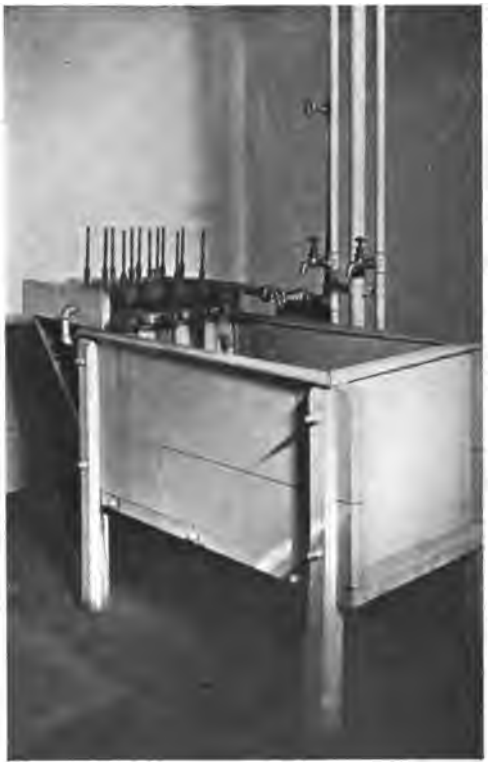


Fig. 152.—Bottle and flask cleaner.

EQUIPMENT OF THE MILK LABORATORY

After the pasteurizer, which has already been described, the piece of technical mechanism of greatest importance is the bottle and flask cleaner. This apparatus, shown in Fig. 152, is a simple device, upon the correctness of a few details of which, however, will depend its efficiency, and there are many commercial elaborations of it. There are three pipes leading to the cleaner jets, each controlled by a stop-cock; one feeds cold water in a spray into the bottles on demand, another feeds hot water, and a third feeds live steam, all under pressure. The cold-water pipe is first used to wash the milk from the bottle, then the hot water is turned in to complete the cleaning process, and the final step is to completely sterilize the inside of the bottle with live steam. It will not do to reverse this order, as the hot water used first will fix the particles of milk to the inside of the glass.

A refrigerator in the milk laboratory is absolutely necessary, but need not have water-tight compartments for setting the flasks of milk in water. Tanks of water in refrigerators give rise to endless disagreeable features, such as spilled milk and grease, without any compensating advantages. The temperature of the refrigerator

may be kept at any desired point, and the refrigerator may be fitted with shelves to contain any number of receptacles. It seems not to be necessary to maintain a temperature lower than 40° F. in the milk refrigerator.

The laboratory should contain a two- or four-burner gas range; oftentimes it is necessary to cook a feeding such as barley or the various pea or bean meals, and the gas is handy for such purposes. Sometimes, too, a considerable quantity of sterile water may be required, and, unless there is a sterilized water faucet in the laboratory, it is convenient to sterilize the water with gas.

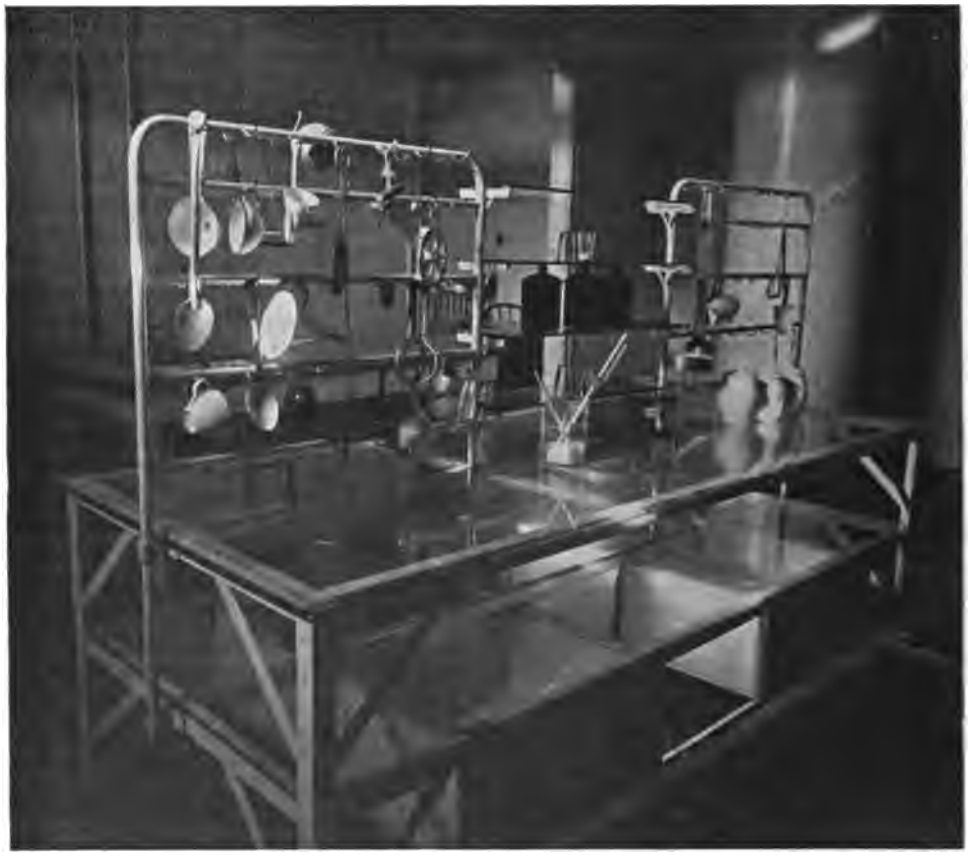


Fig. 153.—Glass-covered table for milk laboratory.

Figure 153 shows a glass-covered work table, with drawers beneath and with a center rack of shelves above. It will be always necessary to have sterile filters in the laboratory for filtering the milk, both when it comes into the laboratory fresh, and perhaps afterward at some stage of formulation required.

Clean sterile towels and cloth sieves of various sorts are necessary, and these articles should be sterilized in the ordinary laparotomy drum, such as is shown on the work table, and they may be kept sterilized until wanted for use; they should be kept in the drums in the drawers under the work table. There should also, of course, be an ordinary wooden table connected with the hot- and cold-water sink; the top of this table may slope to the sink, and be grooved, such as is used for

ordinary dish-washing purposes in most kitchens, but this one may be on a larger scale.

The moving machinery of the milk laboratory may be operated either from a main shafting placed on the ceiling on anchors, or may be run on anchors just above the floor. This main shafting may be run from a motor, and the pulleys operating each machine may be devised of a size to give the proper speed to each individual machine. In the absence of electric power, it will be possible, though hardly profitable or economic, to operate these machines by hand, and this can be done the more easily with the separator and churn. The essential pieces of machinery in this room are the separator, the ordinary Sharples machine, selected in the matter of size according to the amount of milk to be separated; a churn; a Babcock tester; and some mechanism by which milk in course of formulation into prescriptions can

Fig. 154.—Apparatus in milk laboratory.

be peptonized or prepared, and agitated and heated at the same time. These various machines are shown in Fig. 154. The churn and separator are generally known, and will not require description, excepting that it might be well to suggest that those who contemplate having a churn that will last for any considerable length of time ought to have it made, and not trust to the usual makes found on the market; it seems there are none that will hold together working under power for longer than a few weeks. The churn must be made of heavy galvanized iron, preferably nickeled on the inside, and reinforced with heavy bands both ways. The lid must be gasketed with a rubber composition set in between the lips of a double-lipped rim, tongue-and-grove-like.

The peptonizer for preparing a considerable number of individual prescriptions, especially for the children's department (Fig. 155), is a flat copper boiler set up

off the floor so that a circle of gas jets can run beneath it. There are a number of holes in the top of the boiler to fit the containers. The boiler is pivoted on the bottom and connected up to a bell crank running from the main shafting, which, when the mechanism is at work, makes the boiler and its contents vibrate backward and forward over about 30 degrees of a circle, and this backward and forward move-

Fig. 155.—Peptonizer, or predigestion apparatus.

ment keeps the contents of the cans stirred up; it is a very efficient means of cooking milk formulæ so that they will not burn and so that the solutions will cook well mixed. The mechanism is merely a multiple rice-cooker, made to vibrate while the contents of the cans are simmering in the boiling water of the tank, making it unnecessary for some one to stand by to stir the mixture.

THE COMMERCIAL MILK

While we should greatly desire a better quality of milk for the sick adults in the institution than that which we would be willing to accept for culinary purposes, and for such well people as interns and nurses, we shall rarely come across conditions in which a different contract for these two forms may be had on account of high prices and difficulties largely local.

In these days of quick transportation and almost universal "milk-train" service in the large centers of population where the milk problem is acute, it should be possible to get milk fairly clean not more than twenty-four hours old and transported in iced cans. But for the trusts this quality of milk service would be the rule everywhere; as it is, these combinations seem to dominate the transportation lines, and are in many places able to throw such hindrances in the way of prompt service that the wise hospital administrator prefers to employ his energies in more congenial occupation than in constant warfare with a situation in which his oppo-

nent has all the advantage of time, special talent, and a better knowledge of the tricks of the trade.

Checking up the Milk.—With all these disadvantages, however, there are a few checks on our milk supply that may be profitably employed. If we can get our supply from a single producer, even through the kindly offices of a member of the trust, we may exercise some small sort of inspection of the herd and premises whence the milk is derived. We can filter out whatever filth we are obliged to accept. If we can prevent the pasteurization of the milk before we receive it, we shall have the right of protest, at least, if the bacterial count runs high, as indicating the age of the product or its improper handling in transit. When the milk is permitted to be pasteurized before we get it we lose this opportunity, because there is no way, laboratory or otherwise, to determine the amount of toxins present until the damage to a sick child reveals the actual condition. If we have a raw milk and a bacterial count, we may realize pretty definitely how far we can go in giving the milk out for drinking purposes. Each day's milk should be passed through the institution laboratory by samples for butter-fat and for bacterial count, though there are many of us who would prefer an undoctored milk at 3½ per cent. butter-fat to a doctored 4 per cent. article. The laboratory cannot only keep check on the bacterial count, but by occasionally staining up for colon and other bacteria of filth, maintain some sort of reckoning of the cleanliness of the stables and the method of handling.

MILK IN THE HOSPITAL

Nearly all the health authorities of the larger cities are alive to the intolerable milk situation and the inefficiency of the flash methods of pasteurization. Recently

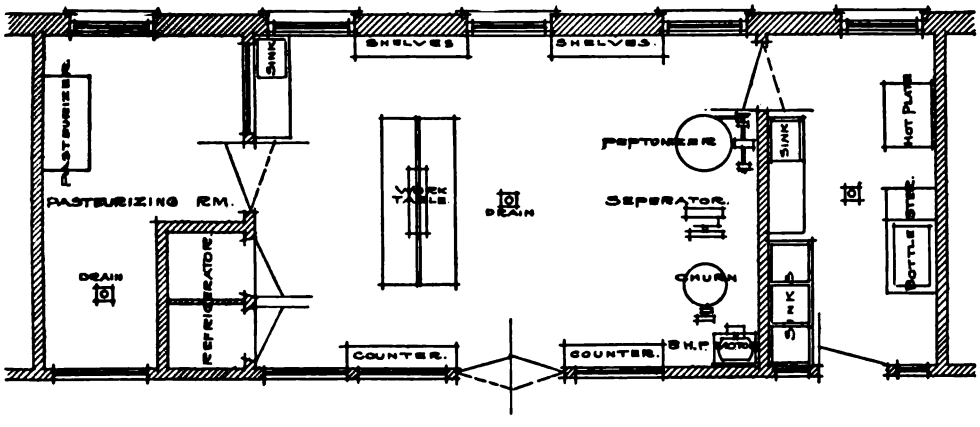


Fig. 156.—Floor plan for milk station.

their activities have begun to make an impression, and to force a corresponding activity on the part of the milk venders. In many parts of the country efforts are now being made to find a "holder" method similar to the one illustrated from the Michael Reese laboratory, and which could be made to serve the purposes of a large commercial necessity.

The methods so far developed are two in number: one in which the milk is pasteurized in the large 100-pound cans by a system of agitation while the cans remain in the tanks, so that the milk nearest the water will not cook, while that at the center of the cans remains unheated; and the other, a mechanism closely resem-

bling the chain-grate of the power plant. In this method the ordinary quart bottles, fitted with rubber cork and glass tube, are immersed at one end of the tank on an endless chain-grate moving at a rate that will keep each bottle under water just the length of time necessary to achieve the desired result. As the bottles leave the bath the rubber corks are removed and sterilized caps are substituted. This last-named process promises to be the method of choice for the future. A third method, which, however, does not promise very much from a scientific standpoint, consists of a long coil of tube suspended in hot water. Each particle of milk is supposed to take a certain time to traverse the tube and to be pasteurized on its completion of the journey. This method depends on too many obvious hazards to entitle it to very much consideration.

Floor plans of a very good milk laboratory are shown in Fig. 156.

ISOLATION AND DISINFECTION

CLASSIFICATION OF DISEASES FOR ISOLATION

THE text-books on hygiene effectively treat of the communicable diseases and modern means for their prevention and isolation under ordinary conditions, and it would be a task of repetition and compilation to go over the general field in a work of this character; we shall, therefore, confine ourselves to a discussion of the infections that present themselves as problems in institutional management, and the simpler and more economic methods to be employed in dealing with them.

Discarding, then, all the classic groupings of the transmissible diseases, let us divide them for our purposes into two great divisions, according to the means by which their toxic properties may be attacked and destroyed. In this classification we may place in one group:

(*a*) The eruptive diseases of childhood—small-pox, scarlet fever, measles, chicken-pox, and German measles.

(*b*) Those unclassified diseases of childhood of unknown origin—mumps and whooping-cough.

(*c*) Diseases with localization in the respiratory tract—tuberculosis, pneumonia, and diphtheria.

(*d*) Those diseases referable more especially to the gastro-intestinal tract—typhoid fever, dysentery, and cholera.

(*e*) Erysipelas—a highly communicable streptococcus infection.

(*f*) Epidemic cerebrospinal meningitis and, perhaps, poliomyelitis, that is just now receiving so much attention.

(*g*) Gonorrheal disease, expressed more particularly as a gonorrheal vaginitis in infants.

(*h*) Syphilis produced by spirochætæ.

(*i*) Certain of the pyogenic or pus infections, communicable to a limited degree if abnormal conditions prevail. Extremely important for our purposes is the pyocyaneus, or green pus infection, so common in the surgical wards of unclean hospitals; we may likewise include here such of the streptococcus and staphylococcus pus infections as we recognize as postoperative complications, and against which we must exercise the greatest precautions, especially in operating- and dressing-room asepsis.

In the second group we shall include the few but virulent diseases due to spore-bearing micro-organisms, the chief peculiarities of which are shown by their resistance against all known bactericidal agents, and also by the violence and rapidity of their pathogenic activity. Chief of these micro-organisms, from the standpoint of communicability, is anthrax. In the same class, though not as readily communicable, we may add tetanus, malignant edema, and the so-called gas bacillus infection of Welch; the latter, if communicable at all, occurring through contact with contaminated earth conveyed to an open wound.

Disinfection against and precautions involved in the care of patients suffering from any of this second group of infections are so wholly within the province of the medical profession that we would hardly seem warranted in giving them adminis-

trative attention except under special medical direction in each individual case. We shall, therefore, give no further consideration to this group in this section.

There are some very radical differences between the various classes of infections that we have characterized as members of the first group, not only in their pathology, cause, course, and chief characteristics—they differ quite as materially from the standpoint of their communicability and the avenues through which they may be transmitted. Perhaps it will be better if we take up these various classes of communicable diseases and view them in a many-sided way for purposes of isolation and disinfection.

DISEASES OF CHILDHOOD

Let us first consider the eruptive fevers of childhood and mumps, whooping-cough, and diphtheria.

Diphtheria is primarily, in most cases, localized or rather manifest in the pharynx, nasopharynx, and larynx. The bacillus of diphtheria is also found in the discharges from the ears, nose, and other mucous membranes, and sometimes on the skin.

While we do not know the exact etiology of the eruptive fevers, reasoned by analogy it may be assumed that they are of micro-organic origin. The skin is the seat of their chief activity, although in many of the eruptive diseases the skin eruption (exanthem) is preceded by an eruption on the internal mucous surfaces. The so-called exanthem, the Koplik spots in measles, and the ocular and nasal catarrhs, are characteristic in all of the eruptive fevers. Mumps and whooping-cough are likewise of unknown bacterial origin, and no specific micro-organism for them has been identified, but they undoubtedly are communicable by way of the nose and throat discharges; so it will be necessary, if we are to take an efficient measure of precaution against the spread of these diseases, that we institute an isolation which shall be at once effective and consistent.

Before we set the machinery in motion for the complete isolation of contagious cases, let us recall what takes place in the admission rooms of the institution.

IN THE EXAMINING ROOM

The patient, usually a child, is brought to the admission room. Perhaps the examiner has been able to make a diagnosis at once, due to the complete development of the disease, and he pronounces it a communicable infection.

We are confronted with an embarrassing situation at the outset, one with which we shall have to deal expeditiously and without regard to sentiment. Most hospitals do not admit known infectious diseases, and the patient must be rejected. The child has been conveyed to the hospital in the street car or, perhaps, in a public conveyance. In the large cities where there is an efficient sanitary régime it would be a punishable offence to allow the child to be returned home the way it came, and thus expose others. In smaller communities where there is no specific law to punish the offender the moral responsibility of an institution pledged to safeguard the health of the people is even greater, because the community is not able to protect itself.

The child must be detained in the examining room with its mother or whoever accompanied it. If it is in a large city, the health department will send an ambulance and take mother and child to some municipal institution for isolation and the care of the patient. If it is in a small town where there are no constituted authorities, some sort of vehicle must be pressed into service that can be subjected to care-

ful fumigation at the journey's end. Fumigation must be quite as efficient as that which would be prescribed for a habitation that had harbored an infected case.

The examining room must be immediately closed against all other patients, thoroughly fumigated, and left sealed for at least twenty-four hours before being used again.

The case must be followed to its destination, and the proper machinery set in motion for the isolation of the patient. The sanitary bureau must be notified or, in the absence of such an institution, the proximity of the disease should in some manner receive publicity.

But, perhaps, it is designed to admit the patient; or it may be that the transmissible character of the disease is only suspected, and the child too ill to be sent away; or, as often occurs, the virulency of the disease is recognized, though the patient is *in extremis*, in which case no institution would be justified in refusing its hospitality.

Then there are cases that develop in the institution after admission, perhaps after the routine observation period has passed, and the patient has been assigned to the ward with other children. In such a case we have not only to isolate the afflicted patient, but we must at once perform a very active duty to the children exposed.

Care of the Exposed.—It is not enough that we remove the infected patient; we must immediately remove the other children from the room, give them a disinfecting bath, including hair, face, and hands, reclothe them in clean apparel, and put them into other quarters isolated from the other patients of the hospital. The room in which the exposure occurred must be washed down, sealed, and fumigated in some such manner as shall be hereafter discussed.

We have now the child suffering from a transmissible disease, and our duty is so exacting and precise that in most carefully conducted institutions it rises to the dignity of a definite technic.

There should be grades of isolation, each disease being considered by itself, the degree and character of the isolation depending on the supposed avenue of communication and the virulence and danger of the disease when once contracted. For instance, Koplik, of Mt. Sinai hospital, prescribes what he calls a "constructive" isolation for gonorrheal vaginitis in infants, scarlet fever, and measles. This isolation allows the patient to occupy a bed in the ward, separated from the other patients by a tape-line suspended from portable posts with broad bases. The effectiveness of this "constructive" isolation depends upon the conscientiousness with which the nurse, intern, and attending physician don gown and gloves before going inside the dead line of half-inch tape. Precautions must be taken so that the individual belongings of the patient will not be used for other occupants of the ward. Some of us who have tried this form of isolation have not been so successful as its exponent.

It has been suggested by other excellent men that scarlet fever may be isolated behind a screen in the general ward, effectiveness here also being dependent on the care of attendants in using gown and gloves; and there is no question that cases of scarlet fever have run their course under such isolation without spreading to a single other patient. But this jeopardizes a ward full of sick children with a minimum rather than a maximum of precaution.

There are surgeons who affirm their willingness to hazard a postoperative case in a ward with erysipelas, merely taking the precaution to have a separate nurse for the erysipelas patient or to insist on separate gown and gloves. Usually the surgeon's reliance on the sufficiency of such isolation is confined to ward patients,

however, and does not extend to his private cases, while the hospital administrator must deal with the infection and not with the importance of the patient affected.

There is a scientific debate as to the transmissibility of pulmonary tuberculosis by indirect contact, as usually exists between patients in the wards of a hospital; the transmissibility of pneumonia under like conditions is also unsettled. Isolation, if instituted, should be complete and in all details should be consistent. The same is true of typhoid fever, supposed by many to be communicable only through the excreta of the gastro-intestinal tract; but many of us have seen cases of typhoid develop in wards where typhoid fever patients were being treated. It may be barely possible that there are other avenues of communication—the nurse's or doctor's hands may convey the infection to another patient suffering from some other disease or convalescing from some illness. It is possible to conceive that the examiner's or attendant's hands may gather up micro-organisms from the external surfaces of the body.

There are numerous well authenticated cases where infection has been carried from one person to another in a hospital ward through the medium of the house-fly, as well as the slower, but equally treacherous bed-bug, where these are allowed to persist. In some experiments made with the house-fly recently it was found that a single fly, marked for identification, had visited a great number of wards and rooms, as well as the hospital kitchen, in the course of a few hours. We need not cite the cases of the mosquito, which has been identified as practically the sole carrier of yellow fever, the Texas tick as the carrier of Texas fever, so common among the cattle of the south, and the rat flea as the carrier of the plague.

If we have diverged from our text of complete isolation, the digression may not be unprofitable if we have resolved that even where the "doctors disagree" we will not let the patient die by any remissness on our part when the remedy is at hand.

COMPLETE ISOLATION

Complete isolation is the care of a patient so far removed from all other persons excepting the nurse that there can be no communication by any avenue whatsoever —either by means of currents of air wafting skin scales, or by the house-fly, mosquito, or other insects; or through the drinking-water or sewage, or by means of the linens, or the dishes, or the cutlery. No effective isolation can be carried out if a nurse or intern, or orderly, or floor man, or housemaid is employed at any point where they have access to or can possibly come into contact with anything used for or by the patient. No physician, nurse, or employee should be allowed to perform duties in any other place after having been in contact with a contagious case. It is often not feasible in a general hospital to isolate an intern as well as a nurse, and in a good many institutions it is the custom to dispense entirely with the services of an intern, and to leave the medical attention to a responsible member of the visiting staff, one who will be sure to take all proper precaution against carrying the infectious matter away from the patient's quarters.

It may be very seriously doubted if efficient isolation can be practised in quarters under the same roof where other people are housed, and especially if some of these are acutely ill with other diseases, and, in consequence, suffering from a lowered resistance.

Separate Building for Isolation.—There should be a separate building for the care of patients suffering from the communicable diseases. It does not make much difference what kind of a building it is, so it is clean and comfortable and located at least several hundred feet from other habitations, and provided with good screens

and the simplest utensils and apparatus. A knock-down house that can be burned when necessary is an ideal place in which to segregate a contagious case or cases. One of the very best provisions is a tent that can be kerosened and burned into the ground. The tent ought to have a plain board floor, raised a foot above the ground, with the earth hilled up around the outside so that moisture cannot find its way underneath. There should be a frame for the canvas, made of two-by-fours. A thimble can be sewed into one side of the tent for the stove-pipe, and an ordinary hot-air stove can be used, or, better still, a Sibley or tent stove made to set in a deep box of sand on the floor.

If the patient and nurse are to be served with meals from the institution kitchen and with linens from the common linen room or laundry, at least three large pails or garbage cans will be required, one for the soiled dishes and cutlery, one for the soiled linens, and one for the garbage. All of these must have tight covers, and there must be plenty of water available in which to soak the things. The cans may set outside the door or under a porch if there is one. The things should be put in at night before the nurse retires, and a 2½ to 5 per cent. carbolic acid solution should be used. The other things should soak over night, and, if faithfully done, no micro-organism except the spore-bearers can live. After the linens are put in the can and the carbolic solution is added and the lid fitted on, the nurse should give the can a violent shaking, so that some of the solution will wash over every possible point. The same can be done with the dishes, care being taken not to break them. The next morning the hospital orderly may with perfect safety gather up the things and take them wherever they belong.

Just one more precaution must be taken: the nurse, after placing the things in the cans, must lift the lid by the handle and set it in place; and in order to shake the can so that the solution may come in contact with all parts of the inside she will have to lay one hand on the side of the can and with the other hold the handle. In this act she may infect the handle and the whole outside of the can; so she must be instructed either to wear gloves for this duty or to wrap each hand in a sterile towel.

The linens and dishes, after removal from the cans, should be washed separately from everything else, so that the odor of carbolic acid will not cling to other linens or other dishes.

Before the patient enters the isolation quarters she should have been supplied with everything that by any chance may be required—dressings, instruments, utensils, towels, soap, and medicines. The nurse should lay in a supply of stores when she assumes charge of the case.

Of course, supplies may be left on the stoop from time to time, and visitors may be allowed, under proper precautions, to talk with the nurse or patient from a little distance, but always from a point "up the wind." Reading matter should be carefully selected with a view to its destruction at the end of the case. Some authorities say books may be fumigated by hanging them over a line in the room and subjecting them to formalin fumes. It may be safely doubted whether the risk is a safe one, especially in these days when reading matter is so cheap.

RAISING THE QUARANTINE

On the termination of the case, as expressed by the attending physician, it is imperative that the nurse and patient take every precaution to remove infectious material from the person before they leave the infected quarters. It is not sufficient to give them the prescribed bath and allow the change of wearing apparel

in the infected rooms. A bath-room adjacent to the sick quarters should be provided, or, when this is impossible, a small tent or portable room may be erected just outside, and complete change of clothing for patient and nurse provided. The room should contain two tubs of warm bichlorid water of a strength of 1: 10,000. The nurse may wash the patient's hair in the same strength of bichlorid water—this may be done before leaving the infected rooms, especially if the patient is a girl or woman with a great deal of hair that cannot be washed by the patient herself; the head may be tied up in a sterile towel.

Then the patient, leaving infected clothes behind, should step to the improvised bath-room, scrub herself thoroughly, put on the clean apparel, and leave the place. If a child is to be bathed and reclothed, the nurse may perform this office after slipping on a sterile gown and gloves. After the patient has received attention, the nurse should go through the same performance for herself, and leave the quarters.

It will be well if the bath waters are left for twenty-four hours, or at least twelve, in order that the bichlorid may destroy whatever infectious matter may have been left in the water. Then a careful person in sterile gown and gloves should dispose of the water where it cannot be got at by man or beast. Wash the tubs in a 3 or 5 per cent. carbolic acid solution and begin fumigation; the bath-room should also be subjected to the process in the manner which shall be hereafter prescribed.

TUBERCULOSIS AND PNEUMONIA

There need be very little difference in the isolation of pulmonary tuberculosis and pneumonia. Isolation in each of these will be performed in a fairly practicable and efficient manner if we prevent the dissemination of sputum, saliva, and blood ejected from the air-passages. The best procedure is to gather this ejected matter immediately after it leaves the patient's mouth or nose, so that it can be destroyed. For this purpose sputum cups with springs for automatically opening and closing the cups may be employed. If handkerchiefs are used they should be soaked in a 2½ per cent. carbolic acid solution for at least twelve hours after they are discarded by the patient; gauze strips used for wiping the patient's mouth and nose should be burned. Drinking-cups, glasses, and dishes used by these patients should be disinfected in a 2½ per cent. carbolic solution for at least twelve hours or boiled for at least one hour. Some patients suffering from either of these infections are too ill to aid in the precautions indicated, and insist upon expectorating on the floor, bed-clothing, and elsewhere; in these cases it is imperative to set up a complete isolation. We know that the tubercle bacilli coughed up from patients' lungs are usually encapsulated in a coating of mucus. This mucous capsule in drying or under heat often becomes extremely hard and forms a shell about the bacillus, rendering it very difficult to destroy. Thus, while a tubercle bacillus grown in a culture-medium may be very easily destroyed under a heat of say 60° C. for twenty minutes, the same bacillus when encapsulated will sometimes resist a boiling temperature for a very much longer period.

Unfortunately, patients suffering from pneumonia are oftentimes delirious and cannot help in their own isolation. Sufferers from pulmonary tuberculosis are decided optimists, imagining that they are about well; even when in a dying condition it is almost impossible to make them understand the necessity of isolation from well people. Thus even under favorable circumstances there ought to be pneumonia wards set apart specifically for that disease in a hospital, and there ought, by all means, to be wards set apart for pulmonary tuberculosis.

We are not quite certain that other pneumococcus infections, such as meningitis, are communicable, but a feeling is becoming prevalent in the medical profession that any disease that originates from the pneumococcus is a dangerous disease to be brought in contact with well people. We know that a good many children are attacked by pneumonia; then a purulent pneumococcus pleurisy may develop, and finally these same children may be attacked by a meningitis, the spinal fluid being filled with the pneumococci. Pneumonia is a blood infection, a pneumococcus bacteremia; thus we are not certain from the very inception of the disease that the micro-organisms will not pervade other tissues, as the upper respiratory passages, the meninges, the bones, joints, and even the peritoneum.

On the other hand, tuberculous affections elsewhere than of the lungs require little precaution against communication. Sometimes joints break down and pus infections follow, but the micro-organisms in these cases are confined pretty well to the pus and dressings of the patient and are easily destroyed. It is hardly credible that tuberculous pus infectious matter could do very much harm in an institution when ordinary care is taken in the destruction of the excreta, dressings, pus-basins, and where the ordinary laws of cleanliness are observed.

TYPHOID FEVER

There seems to be a growing opinion in the medical profession that typhoid patients ought to be completely segregated in the hospital from patients suffering from all other diseases, and that this segregation should continue at least until convalescence is well advanced. There should be distinct typhoid wards sufficient in number and size to accommodate all the patients of different classes; private patients may be segregated in rooms of one or more beds. In any event, each patient should have individual belongings of every description kept separately, excepting perhaps dishes, and these should be soaked after use for at least twelve hours in a 3 per cent. carbolic acid solution.

The other equipment, individual in character, will comprise a long list of articles adequate for the purpose.

Typhoid Equipment

1 large can for feces, urine, and used sponge waters.
1 can for bed-pans and urinals.
1 can for used linens.
1 large sponge basin.
1 compress basin.
1 dressing basin.
1 pus-basin for bedside.
2 large sponges.
1 rubber coat, gown, or apron for nurse.
1 bath blanket.
1 bath thermometer.
2 sets of stupes.
1 enema set, including small rubber sheet.
1 rectal tube and funnel.

Note.—Sterilizers for feces, urines, sponge waters, and excreta of all kinds emanating from typhoids must be used instead of cans in this progressive day. Such sterilizers are described under the equipment section on Sterilizers.

Assuming that the typhoid patient occupies a bed in a single room or in a ward where there are none others excepting typhoid patients, it will not be difficult to take the necessary precautions against infection of other patients by direct contact. The nurse will necessarily care for only typhoid patients, and she will do so while wearing gown and gloves, or at least when she leaves the quarters she will so effectively cleanse her hands that there will be little likelihood of carrying the infection, especially if she has used a gown and head-cloth during her hours of duty.

The only elements of danger, therefore, seem to be the excreta, bath-water, and contamination by dishes, linens, and used material intended to be thrown away.

Dishes, drinking glasses, and cutlery should either be kept for the patient individually and confined to patient's quarters, or should be boiled each day before being sent back to the kitchen, or, better still, they should be soaked in a 3 per cent. carbolic acid solution over night. Stools should be disinfected for at least six hours in a 2½ per cent. carbolic acid solution, the quantity of carbolized water being the same in amount as the stool. Urines should be disinfected for at least six hours in a 1 : 1000 bichlorid solution, equal parts urine and solution. Linens should be soaked for at least twelve hours in a 2½ per cent. carbolic acid solution, and then rinsed in clear water before being sent to the laundry for further washing. Bedpans, urinals, and basins should be kept in the cans provided for the purpose in a 2½ per cent. carbolic acid solution or boiled.

There are now in use in the slop-rooms off each typhoid ward in most large institutions special sterilizers for the destruction of materials infected with typhoid—one for linens, one for utensils, including the stool and urine, vomitus, and contents of pans and basins. These sterilizers are described more in detail under the section on Equipment of the Hospital.

ERYSIPELAS

Erysipelas is a streptococcus infection, of which there are two forms—the traumatic, which attacks a wounded surface, and the idiopathic form, which attacks an apparently unbroken skin surface, although in these cases there is undoubtedly a microscopic abrasion. There are other diseases or manifestations that seem to belong to the same family, and are equally infectious and equally harmful, namely, the phlegmons, the so-called lymphangitis, and some of the forms of cellulitis. These, if not identical, are so closely related to erysipelas that the terms are almost indifferently used by many surgeons. Some surgeons are disposed to class them as non-transmissible, but many hospital administrators have permitted lymphangitis and phlegmonous cases in the surgical wards of the hospital only to find themselves in the midst of an erysipelas epidemic in a few days. Among those who are best posted concerning the character of these inflammations it is assumed that any one of them is sufficiently communicable and sufficiently harmful in the surgical wards of a hospital to warrant immediate removal and complete isolation. There is no doubt that erysipelas in any of its forms is one of the most virulent infections that can come into an institution, and its power for harm, once there, is almost without limit. In fact, there are many excellent authorities who fear erysipelas much more than any other communicable disease. So that in prescribing a line of conduct for meeting the appearance of a case of erysipelas it should be very strongly urged that complete isolation in the way prescribed heretofore is the only efficient manner in which to dispose of this disease.

CEREBROSPINAL MENINGITIS

Epidemic cerebrospinal meningitis is not nearly so formidable a disease now as it was a few years ago. We know that the epidemic form of cerebrospinal meningitis is caused by a micro-organism—the meningococcus, a non-spore-bearer not very difficult to destroy and one whose origin in the body is difficult to trace. The infection which it causes has always remained in more or less mystery, that is, the avenues of contact in an epidemic of cerebrospinal meningitis have not been quite well understood. When there is an epidemic of typhoid fever we can generally trace the infection to bad water or to some other equally positive avenue of communication, and so with a good many of the definite infections, but it is not at all the case with the epidemic meningitis. Some epidemics are very mild and some so severe that most of the patients die. In some epidemics the patients live for considerable periods of time—days or even weeks—but eventually the disease culminates fatally in a great many of them. Again, the patients will die almost within a few hours after the onset. The symptoms vary in individual cases and with different epidemics. While there has been a great deal of speculation on the part of scientists, hygienists, and sanitary experts, as well as pathologists, no one has offered any reasonable explanation of the manner in which the disease is transmitted.

The pathologists, as a rule, are rather disposed to disavow communicability between a patient suffering with this infection and a well person, and at the same time they advise a pretty rigid isolation; until something more is known about the disease and its mode of communication, institution administrators are hardly doing their full duty without taking ample precautions for the segregation of sufferers from this infection. During epidemics it may be that wards can be set apart for these patients; at other times the patients in small groups of one or two may be segregated in private rooms or in very small wards. Rigid disinfection should be practised in disposing of the discharges from the air-passages and from the skin. The linens, bath-water, and all contaminated material should receive attention.

The weight of authority seems rather to lie in the presumption that the micro-organism emanates from the air-passages and pervades the atmosphere during the time of an epidemic, and that it is carried from a sick person to a well one. Whatever form of isolation is practised should provide for a rigid cleanliness of the body of the patient and attendants, so that infected particles may not be carried through the atmosphere.

The disease itself has been to a great extent brought under control since the creation of an antimeningitis serum. This serum is not given to prevent the disease, but to effect a cure where it actually exists. The technic for its use is so thoroughly within the province of the medical profession that it should always be given under strict medical direction.

GONORRHEA

Most general hospitals do not accept patients suffering from active gonorrhea, and the type of that disease most frequently met in the institution is that which manifests itself as a gonorrheal vaginitis in children, especially infants. The micro-organism itself is one of the most difficult to grow artificially. It has little or no vitality, and dies in the open air in a very short time. This micro-organism infests the crypts and folds of the urethra and vagina, and it is as difficult to dislodge as it is to reach with destructive agents.

The laboratory finds no difference between the micro-organism that causes gonorrhea in the adult and that form found in the vaginitis of infants, but it is a well-known fact that there are clinical differences between the two. For instance, medicolegal literature is replete with cases of gonorrhea contracted by small children during rape at the hands of an adult suffering from the disease, and the disease when attacking these children is most virulent in its form and places the patient in jeopardy of her life. The inflammation is intense, the invasion of the infection tremendous, and oftentimes the infection has found its way into the Fallopian tubes, setting up a fatal peritonitis. Whereas the vaginitis contracted by one small child from another in the wards of the hospital or in the homes of the poor is a vastly different matter. It is almost passive in form; the discharge may be profuse, or at times is very slight or intermittent, but it is appalling to hospital administrators everywhere by its persistency and the difficulty with which it may be stopped short of infecting every child in the ward where it once obtains a footing.

Complete isolation is the only effective way to prevent house epidemics and ward infections.

It is claimed by some hospital administrators that careful segregation of patients and provision for supplying each patient with individual belongings in the wards of a hospital tends to prevent the spread of infection. Those who have had wide experience do not agree with this view, and insist upon immediate removal of children suffering from gonorrheal infection.

The wide prevalence of gonorrheal vaginitis seems to have set a new problem for laboratory men, and even they seem at a loss to account for the long incubation periods. Children have remained in hospitals for a month or more with no reasonable explanation advanced as to how the infection occurred. The question has arisen, and it is not yet settled, whether the incubation period has been so long, whether the disease was contracted for the first time by some apparently inconceivable process, or whether it had the faculty of remaining latent in the crypts and folds for an indefinite period. At any rate, the common experience with the disease seems to call for a more complete isolation than for almost any other disease of childhood.

The adult variety of gonorrhea seems a vastly different thing, and ordinary precautions seem to be sufficient to prevent its spread, either from one patient to another or from a patient to an attendant.

The disinfection of dishes, linens, and the belongings of patients suffering from gonorrheal vaginitis should be complete if the articles are soaked in a 2½ per cent. carbolic acid solution over night.

SYPHILIS

The avenues by which syphilis is communicated and the infections produced are quite definitely understood. They are:

(1) Direct contact of a syphilitic ulcer or primary sore arising from the surface of an infected person with denuded skin or mucous membrane of a well person; this means acquiring the infection during cohabitation or in the act of kissing.

(2) Contact of a denuded mucous membrane or skin surface of a well person with an area that has been contaminated or infected by sufferers from an active syphilis; this means the contraction of the disease from a privy-seat or from a drinking-cup.

(3) The use of towels or bed linen by a well person that have been used by a sufferer from an active syphilis.

(4) Contact which occurs when people sleep together; the body of a well person comes in contact with the skin of a sufferer from syphilis and so acquires the disease.

(5) By heredity—one or both parents may be syphilitic.

We will notice that all of these avenues of communication are either by direct contact of an infected person with a well person, or by a very close form of indirect contact, through the medium of an infected surface.

In attempting to isolate a sufferer from syphilis we may neglect the possibility of any communication through the wafting of particles in the atmosphere. With that exception the modes of communication for syphilis might be the same as those in many of the other communicable diseases. It is conceivable how a patient might expectorate matter containing spirochætæ or that the stools or urine might carry syphilis virus. In isolating a syphilitic patient the various possibilities of infection should be borne in mind.

Until recently it had been very definitely understood that only during the primary and secondary manifestations of syphilis was the disease communicable at all, excepting that a sufferer from the tertiary or latent stage of the disease could communicate the disease to offspring. That general rule seems to be losing ground, and pathologists are coming to the conclusion that some of the tertiary forms of syphilis may also be communicable, as, for instance, the gummata. At least, the spirochætæ have been found in the gummatous tumors of syphilis, and they have likewise been found in syphilitic nodes and syphilitic ulcers in different parts of the body. In recent years a diagnosis of the disease has been made in obscure cases by finding the micro-organism of syphilis in unsuspected foci. We cannot any longer feel the same amount of security that was formerly felt in dealing with tertiary syphilis in the wards of a general hospital, and such patients should be isolated to provide a double security to patients suffering from other diseases.

PYOCYANEUS

The pyocyaneus, though not a very virulent infection, is most troublesome in preventing the healing of the wounds of postoperative cases, and delays the recovery of patients oftentimes to a most exasperating degree. In pyocyaneus-infected wards slides exposed in the atmosphere or brought in contact with the dust of walls or floors will plate out almost pure cultures in the first generation. Fortunately, this is one of the easiest of the infections to be rid of.

PYOGENIC INFECTIONS

In addition to the above, certain surgical infections characterized by pus formation, usually due to either the staphylococcus or streptococcus micro-organisms, are not of infrequent occurrence. We know, of course, that we have various strains of the streptococcus and staphylococcus everywhere in every-day life which we do not regard as pathologic. These micro-organisms are harmful only under certain conditions, but in the surgical wards of a hospital and especially in the operating-rooms they are harmful at all times, and that is why we should observe strict asepsis in the operating-rooms. There is no doubt that it is more difficult to infect a pus-forming wound than a new cut made in the operating-rooms, because in this fresh wound an immense amount of absorption takes place by way of the circulating blood and lymph. In a pus wound, on the other hand, the absorption is very slight, if, indeed, there be any at all; so that against these pus infections our precautions

will be taken almost exclusively in the surgical operating-rooms, and they must come in the way of an asepsis, not only in the operation itself, but in the preparation.

In all these infections, after a patient suffering from them has been removed into isolation, it will be highly necessary to take all other patients out of the room or ward and to fumigate and disinfect the room and its contents somewhat after the manner which we shall now proceed to describe.

DISINFECTION

The terms "fumigation" and "disinfection" seem to have become, by common use, interchangeable, just as have the terms "infectious" and "contagious." As this is misleading and artificial, there is a disposition to discard one or other of these terms. It may be well to use the term "disinfection" entirely, notwithstanding the fact that the word "fumigate" implies a gaseous process, since it comes from the French word "fumier," meaning smoke or vapor.

Disinfection is the process by which articles of whatever nature are freed from micro-organisms. There are many agents that will destroy any micro-organism under proper conditions; so that the question before us is to determine the best agent with which to bring about the destruction of harmful micro-organisms with the greatest possible convenience of operation and at the lowest expense in the situations in which they are found in hospital practice.

Agents of disinfection may be divided into two classes: physical and chemical.

Physical agents may be subdivided into two principal classes: dry heat, or the process of burning; and wet heat, or the process of destroying by boiling water or steam.

Chemical agents may likewise be divided into two classes: those in the form of solutions or liquids and those in the form of gases.

Now let us see just what these agents mean and the conditions under which they may be best used.

The burning process is available and, in fact, best of all for those infected articles that are not intended to be kept, such as books, newspapers and magazines, old rugs, bandages and dressings that have been used in infectious cases, dirt and dust from the floors and walls, and the sweepings generally from infected quarters.

Boiling water will destroy any micro-organism, even the hardiest, if the boiling process is continued for a minimum of ten minutes; most pathogenic bacteria are destroyed in five minutes. Linens, dishes, and utensils taken from infected quarters should be boiled for at least ten minutes. This process is efficient and is, perhaps, cheaper than any other process we can employ. Blankets and other woolen goods will not stand boiling. Cutting surgical instruments, such as scissors, knives, and needles, should not be boiled, because the water causes oxidation of the metal at the highly tempered cutting edge and dulls it; they should be soaked in carbolic acid.

Both live steam, or steam under pressure, and latent or wet steam are employed for disinfection purposes. Wet steam serves our purposes not very much better than boiling water, since the temperature does not very much exceed the boiling-point. Live steam is much more effective. Pressure exerted upon steam causes an increase of temperature; a pressure of 15 pounds on a volume of steam will raise the temperature from the boiling-point, 212° F., to 250° F. The live-steam apparatus, used for sterilizing dressings, is fitted with a vacuum-producing appliance. After placing the articles—gloves, linens, dressings, gauze, etc.—in the

sterilizer, a vacuum is first produced to draw out all possible air; after ten minutes the live steam is introduced, twenty minutes sufficing to destroy the micro-organisms; the vacuum is again employed to remove the steam from the sterilizer and its contents, and the articles may then be taken from the sterilizer dry and ready for use. This does away with the necessity for exposing the articles to reinfection during a drying process in the open air after removal from the sterilizer.

Naturally, the articles that we sterilize under live steam in these dressing sterilizers are those that must be kept sterile after thorough disinfection and ready for use in the operating-room. We not only want to destroy the infectious matter or micro-organisms that may be present, but to do so under conditions that they may be kept sterile afterward, as, for instance, in the ordinary laparotomy drums.

Chemical Solutions.—Chemical solutions are employed for disinfection where it is not convenient or practicable to use fire, boiling water, or steam. There are many chemical germicides, and new ones are being introduced from time to time, but the three upon which we have come to rely for institutional work are: carbolic acid, bichlorid of mercury, and the various chlorin solutions.

Chlorin.—The chlorins are destructive basically; they are bleachers, and they destroy fabrics. In addition, the chlorin compounds are much more expensive than others, so that for disinfection purposes solutions are reduced to a choice between carbolic acid and bichlorid of mercury. It may be doubted whether chlorid of lime sprinkled into toilet bowls and in catch basins is much more than a deodorizer, and it is very certain that its effectiveness is limited to the micro-organisms with which it comes into actual contact.

Carbolic Acid.—In the use of carbolic acid we have a choice of two strengths—either the so-called chemically pure, or 95 per cent. solution, and the concentrated aqueous solution, which will not exceed 5 per cent., because carbolic acid is very slightly soluble in water. Either of these strengths will destroy any of the micro-organisms, the difference being one of time alone. A 95 per cent. solution of carbolic acid will destroy spore-bearing micro-organisms, such as anthrax, in two or three minutes, whereas the 2½ or 5 per cent. solution may require several hours to perform the same work. We use the 95 per cent. carbolic acid, however, for very few purposes because of its destructiveness and the likelihood of its burning those who are working with it. The principal use of the strong carbolic acid is for the immediate sterilization of cutting instruments in the operating-room. As mentioned previously in the section under Operating-room Technic, it is the common method to immerse instruments, especially the cutting instruments, in a 95 per cent. solution of carbolic acid for three or four minutes, then to rinse them in alcohol, and finally in sterile water. This procedure does not destroy the cutting edge and allows the continuous use of one of these instruments throughout an operation by providing a ready means of resterilizing if it has touched pus or some infected area in the operating field. The 2½ or 5 per cent. carbolic acid solution has a vast field of usefulness. It is often impracticable to destroy infectious excreta like feces and urine by boiling them, and this may be done fairly satisfactorily in a weak solution of carbolic acid if the process is continued for a sufficient length of time; wherever possible it is desirable to leave infected material in carbolic acid over night or for about that long a period, and to add some chemical like hydrochloric acid to break down any albuminous envelope in which the micro-organisms have become encased. Linens, excreta, dishes, or cutlery that have been used by infected patients can be efficiently sterilized in these 2½ or 5 per cent. carbolic solutions.

There are two objections to the use of carbolic acid: one is the disagreeable odor, especially in institution practice, where the odor of carbolic acid is recognized as

the odious "hospital smell"; the other objection is its irritating effect on the hands of those who work with it in even the low percentages. There are persons whose hands will not permit the use of even a 1 per cent. carbolic acid solution, while a 2½ or 5 per cent. solution is irritating to the most tolerant skin.

Bichlorid of Mercury.—The objection to corrosive sublimate solution, even in the high percentages, is that in coming in contact with infectious matter like pus, or infected blood or excreta of any kind, it unites with the albuminous matter in these materials to form an albuminate of mercury, which forms a coat or shell over the matter to be disinfected, and acts as a protection to the micro-organism by preventing the penetration of the disinfecting solution. This objection, however, is readily overcome by adding to the corrosive sublimate solution a small amount of a 5 per cent. solution of tartaric or citric acid, sodium chlorid, or ammonium.

Naturally, bichlorid solutions cannot be used to disinfect metals, because they form a coat of mercury. However, corrosive sublimate solutions do not destroy fabrics of any kind, and they are not hurtful to the hands or exposed skin of those who use them, excepting, of course, in a very concentrated strength, and it is not necessary to use such solutions as this. Even solutions of 1 : 500 will hardly hurt the hands.

Like nearly all of the other disinfecting agents, the question of concentration of corrosive sublimate is a question of time rather than efficiency; 1 : 500 solution will destroy almost any of the micro-organisms in a few minutes, but 1 : 10,000 will destroy almost any of them in twelve hours; if we are to disinfect because of any of the ordinary infectious diseases, we may perhaps strike a happy medium of 1 : 2000 for articles that must be cleansed in a few minutes, using the greater dilution for those things that can be left to stand over night in the disinfecting solution.

The bichlorid solutions have no odor and will often be preferred on that account to carbolic acid. Bichlorid of mercury is cheap, and its use need not entail any considerable expenditure under any circumstances. Great care must, of course, be taken to keep it beyond the reach of animals or children, because it is extremely poisonous when taken internally.

Gases.—There are a number of irritant gases which, when used properly and under favorable conditions, will destroy most of the micro-organisms that can by any chance be considered harmful to the human body. There are disadvantages connected with the use of most of these gases, and, therefore, manufacturing chemists have from time to time placed upon the market new gaseous agents to be operated under new processes, some of them simple and some complicated, but all of them advertised with an attractiveness that rather favors their use. Only three gases, however, are really worthy of consideration, and one of these, chlorin, may be discarded because of its destructiveness to fabrics of all kinds and its hurtful bleaching properties. The other two are sulphur and formaldehyd.

Sulphur.—When used as a fumigating gas, the procedure is as follows: Take 5 pounds of rock or rolled sulphur for each 1000 cubic feet of air space, divide it into small particles about the size of a filbert, add a sufficient quantity of alcohol to permeate the sulphur, set the whole in a metal pot several inches above the floor, and surround the container by water to avoid all chances of fire.

If the area to be fumigated is made air-tight by sealing the cracks around the windows and doors this disinfecting gas will destroy every micro-organism with which it comes in contact. Because of its special power to destroy vermin, insects, rats and mice, mosquitos, bed-bugs, and cockroaches, this gas is employed more frequently on shipboard and under the quarantine regulations of all civilized nations than any other gaseous disinfectant. The area to be fumigated should be left sealed

for not less than twenty-four hours, and should thereafter be aired for at least twenty-four hours more, with all windows and doors open, before permitting a person to use it for habitation. The penetrating power of sulphur disinfection depends almost wholly upon the amount of moisture in the atmosphere during the disinfecting process. The atmosphere may be moistened by hanging up sheets which have been wet or by vaporizing water by heat. Laboratory experts tell us that about 1 pint of water should be evaporated for each 1000 cubic feet of space to be disinfected. It may be added that this moisture is sometimes produced by allowing the radiator vent to remain slightly open, allowing a quantity of steam to escape into the room. Sulphur is, like chlorin, a great bleaching agent, and should not be used where there are colored fabrics.

Formaldehyd.—Nearly all the manufacturing chemists have on the market some proprietary form of formaldehyd disinfectant. Usually these purchasable disinfectants come in the form of a candle or lamp arrangement. Most of them are inefficient. Some of them are strong and perform the work of liberation of the gas in a few minutes. In others the dilution is higher and the time of liberation extended.

In large institutions, and where the saving of material is an item, formaldehyd disinfection may be reduced to perhaps its very lowest cost and its highest efficiency in the following manner:

Formalin, or 40 per cent. formaldehyd solution, may be purchased at 11 cents per pound in kegs of 135 pounds. Unless great quantities are to be used it will not be expedient to buy more than 135 pounds at one time because of a certain amount of deterioration. Permanganate of potash may be purchased in small crystals at 11½ cents per pound in kegs of 112 pounds. Any kind of metal pot with a large mouth may be employed in the fumigating process, as long as it is sufficiently large to provide for the escape of vapor. A 4-gallon kettle is most suitable. For each 1000 cubic feet of space to be disinfected the proportions will be 1 pint, or 1 pound of the formalin to 8 ounces of permanganate, and this means an expenditure of 17 cents for each 1000 cubic feet of space to be disinfected.

Before the two materials are poured together the pot should be set upon bricks or, at least, upon some non-combustible base several inches above the floor, and all windows, ventilators, and doors should be sealed excepting the one door to provide an exit for the person who starts the process, and paste, paper, and brush must be ready for this door before the process is started, so that the sealing can be completed immediately after the last person leaves the room.

Just as in the case of sulphur disinfection, the efficiency of formaldehyd gas will depend to a great extent upon the amount of moisture in the room, but it will also depend greatly upon the temperature of the room. For formaldehyd disinfection the radiators should be turned on or some form of artificial heat employed, as, for instance, a salamander or stove to raise the temperature of the room to 80° F. or more. Then, if in addition to this high temperature the walls are sprinkled with water as available moisture, the penetrability of formaldehyd gas will reach its maximum. The germicidal power of formaldehyd upon micro-organisms of all sorts, under such conditions, is considerable; but, unfortunately, formaldehyd gas does not destroy vermin, such as cockroaches, bed-bugs, or even mice and rats, unless concentrated to a degree and maintained for a length of time out of all reason for purposes of institution fumigation.

Institution executives have been living in the hope that some certain means of efficient fumigation might be found for treating rooms and wards that have recently housed communicable infections. It seems that their hopes are not yet

realized. Anderson, of the Public Health and Marine Hospital laboratories at Washington, and a number of other excellent pathologists have recently done much valuable work in this field, but the net results to date seem to consist of a warning, in chorus, that no fumigant yet suggested is efficient for the destruction of the pathogenic micro-organisms at large in the ordinary hospital room or ward under the conditions that prevail during its employment. Negative results are said to be many times quite as valuable as those that are positive, and this is almost true in this case; at least, if we have proper warning that the elaborate technic of fumigation that most of us are accustomed to employ is futile, we are enabled to protect our patients by not subjecting them to the hazards of infection under conditions most likely to be disastrous. For instance, we would not be likely to place a maternity patient in a room that had recently housed puerperal fever, or a surgical case in quarters where erysipelas had been recently.

In the Michael Reese Hospital the process of fumigation has consisted of the formaldehyd-permanganate system above described, followed by a thorough washing of the walls and ceiling of the room with a 5 per cent. carbolic acid solution, and a thorough washing of the floor with the same, with a subsequent scrubbing with hot water and soap. All the furniture and fixtures are washed with carbolic. Mattresses, blankets, rugs, and curtain material are placed in the mattress sterilizer under 300° F. of alternate vacuum and dry heat for one hour. We feel that even after this treatment we are not justified in placing in the quarters any patient who would be susceptible to such an infection.

PLANS FOR ISOLATION UNIT

In connection with the section on Isolation and Disinfection, it would seem to be appropriate to produce the major plans for a small isolation hospital to be operated in connection with the Michael Reese Hospital, of Chicago.

This building is intended to care for communicable infections that develop in the main hospital.

There are a few very important factors to be considered in providing a permanent isolation unit:

1. The construction must be such that the quarters can be fumigated and disinfected most thoroughly without damage to the walls, floors, ceilings, doors, windows, and window frames.

2. Arrangements must be included in the architecture by which food may be passed to the occupants of the unit without danger of passing the infection to the orderly carrying it.

3. Arrangements must be made in the architecture by which soiled linens, used dishes, and garbage may be passed out of the unit without danger of infection to those receiving them.

4. Architectural arrangements must be included by which a patient and nurse may be cleaned up and cleared out of the premises without taking any of the elements of infection with them.

5. The architecture must provide quarters for the visiting physician where he may rest in cases of emergency, and where he may be permitted to change clothing for each class of infections, and enter and re-enter his quarters without crossing an infected area while wearing clean apparel. In other words, it must be so arranged that he can step into his quarters, dispose of his outer garments and shoes, clothe himself in proper protective apparel, leave his quarters, visit a patient in the building, return to the quarters, put aside his infected clothing, put on other

clean clothing, visit another patient suffering from a different infection, and repeat these visits as many times as there are classes of infection in the building.

If we have covered all of these points in the architecture of an isolation unit, we have met all the practical necessities of the occasion.

Now let us describe the plans for this isolation building somewhat in detail:

The first drawing, Fig. 157, shows a basement floor that may go as far beneath the surface as necessary, and rise high enough for a 10 or 11 foot ceiling. This whole building is 62 feet long over all, and 26 feet 8 inches wide, not including porches, areaways, or projecting stairs, and has an 11 foot basement, a first floor with 11 foot ceilings, and a second floor with a 10 foot ceiling.

Let us take first the physician's suite of the basement plan. The door enters the areaway into a lounging room in which there is supposed to be couch, tables, chairs, and reading matter, and a series of lockers in which to hang his outer garments. When he desires to prepare for a visit to a patient upstairs he walks into the room marked "Hall," and across into the dressing-room, where he may leave

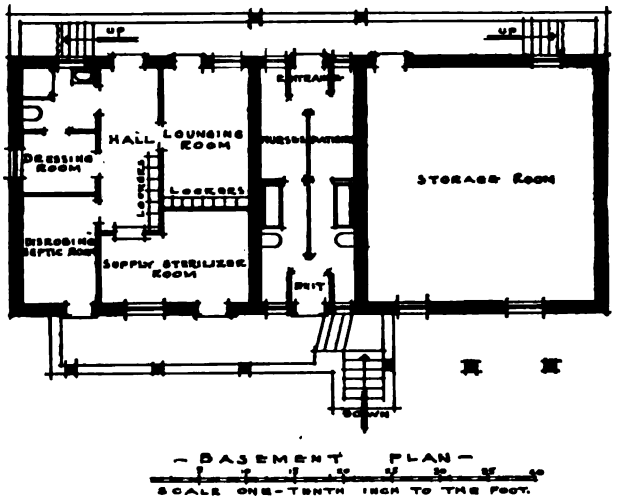


Fig. 157.—Isolation department—administration suite.

his shoes, trousers, coat, vest, and shirt, then back again into the hall to take visiting garments from the lockers in the hallway. He then retraces his steps into the lounging room and out into the areaway, up the stairs, and proceeds up any flight of stairs that may lead him to the suite he wishes to visit. When the visit is at an end he returns to the surface of the ground and into the areaway on the other side of the building, along that areaway until he comes to the door of the room marked "Disrobing Septic Room." There he removes the head-cloth, mouth-cloth, gloves, visiting coat, and white trousers. He then walks to the door leading back into the hall from which he originally went, and at the doorway leaves his white canvas shoes, or throws them back into the septic room as he leaves it. He may then take other visiting apparel from another locker, and visit another patient, and repeat those visits as many times as necessary, always taking the same route. When his final visit is made and he wishes to clean up, he walks along the hallway until he comes to the bath-room, removes all of his clothing, takes a shower-bath, steps through the partition door into the dressing-room, where he dons his street clothing, and goes thence over to the lounging room, and from there out into the

street. It will be seen that in making this journey and repeating it any number of times he does not cross his path at any time. He does not have septic clothing on him except in the septic disrobing room, all the other parts of his suite being clean.

The room marked "Sterilizing Room" is that in which all the isolation department clothing is sterilized by a nurse charged with that duty, and after the sterilizing process is ended she refurnishes the lockers in the hallway with sufficient apparel to meet the demands of the next day or any subsequent time.

If this technic is carefully followed, it would seem that the chances of carrying infection by the physician are reduced to an absolute minimum.

The middle of the basement floor is occupied by a long room 12 feet wide, running the width of the building. There is a vestibule at either end of this small suite, and a partition running the length of the room between the vestibules, dividing this 12 foot space into two long suites, 26 feet 8 inches long and 6 feet wide each. This suite is to be used as clearing space for nurse and patient. If the patient is an adult, or old enough to bathe and put on street clothing, he walks out of the apartment when he is finally released by the physician, goes down the areaway at the upper right-hand corner of the plan as we see it, and into the second door that he meets. He opens the door to his left, walks into the room, takes off his infected clothing, which is made up of wash goods, and drops it into a septic tank provided for the purpose in the corner of the room, and made up of a 3 or 5 per cent. carbolic acid solution. He then walks into the next room without clothing, takes a bichlorid bath, including the hair, in the tub, dries himself, and puts on the street clothing previously placed there for the purpose. He then leaves the premises no longer a menace to the community.

After the nurse has completed her work of straightening up the apartment and preparing it for subsequent fumigation and disinfection, she follows the course of the patient, excepting that she takes the other side of the suite, and goes through the same cleaning-up process, emerging from the same clean exit, and is out in the world again. An electric fan may be provided in the clean apartment, so that she may dry her hair rapidly.

The situation is somewhat complicated if the patient is a child unable to perform the office of disrobing, bathing, and reclothing itself, and in that event the nurse will take the child into the patient's side of the clearing house, and after she has disrobed the child and set it into the clean room, she will have to step back into the septic room again, take off at least her outer garments, put on sterile gown, gloves, and head-cloth. Then she will have to take the child through the bath into the clean clothes room, and finally pass the child to a clean nurse on the outside. She will have previously set her rooms upstairs in order, so that it will be only necessary for her to retrace her steps through the way she has come, over into her own side of the clean quarters, and make her way to the outside world, as previously described.

If this technic shall have been carried out faithfully, it seems there is hardly even a remote chance of conveying an infection from the apartments by either nurse or patient.

The remaining part of the basement floor is left for storage room. It had been originally intended that this remaining room should be finished as an operating-room in the event that a patient in isolation required surgical interference. The element of cross-infections in such cases seemed too hazardous to permit of this plan, and it is designed that a necessary surgical operation shall be performed in the suite in which the patient is located.

Now let us go to Fig. 158, which contains two complete units of isolation, each one for a different infection. There is in one of these suites a ward 15 feet square, with a window at the stairway at the side of the plan, and a second window at the foot of the plan, opening out onto the porch. This window goes to the floor, as it is intended that a patient on a stretcher may be carried into the ward through the window rather than through the door into the small kitchen, and thence into the ward.

The dotted lines across this ward form a triangle, representing brass or nickeled tubing running on anchors from the ceiling. It may be that sometimes there will be a male and two female patients suffering from the same infection, and curtains may be hung as screens from these hangers.

Now let us take the small kitchen at the foot of the plan—let us say, the suite at the left hand. There are in this room gas plate, sink, and small table.

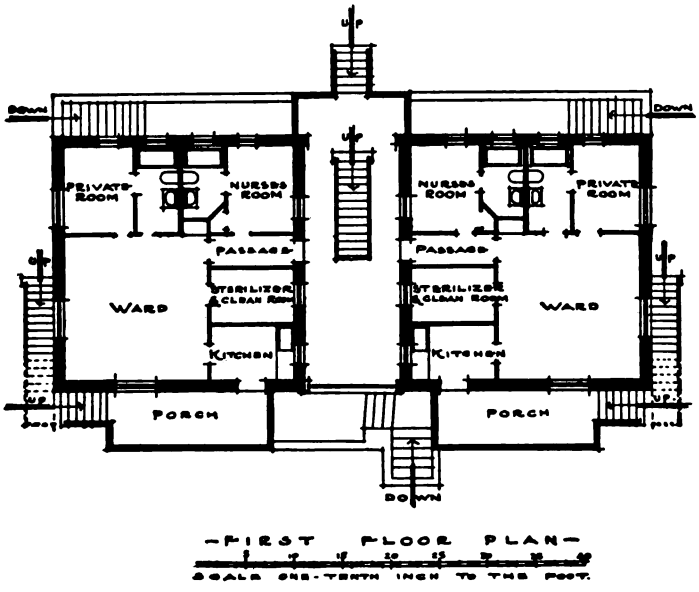


Fig. 158.—Two isolation units.

The next room, marked "Sterilizing and Clean Room," contains a utensil sterilizer and a small instrument or dressing boiler.

At the top of the plan is a private room with bath for a private patient, and a private room with bath for the nurse. A small passageway from this apartment leads out into a hallway at the center of the building, the purposes of which hallway will be described later. This isolation suite is duplicated on the first floor and on the second floor, forming four units of isolation, each one of them entered from an entirely separate entrance, and each of these units has a small balcony in front, which, in our own particular case, faces Lake Michigan, and is intended to furnish a comfortable lounging place for convalescent patients, who are separated by 10 feet of areaway between the porches, and also by a 6 foot solid wall between them.

Now let us take up the center hallway running across the entire building. This hallway is 10 feet wide, runs to the top of the second story, and is open at both ends. A small stair runs from the first to the second floor, as shown in the plan. The purpose of this open hallway is to serve as a medium of communication

for the compartments with the outside world. Food is brought by the orderly for the compartment, and passed through the window into the kitchen or, rather, set upon the slate shelf of the window, so that the nurse can reach it. In our own case a covered metal tray with hot-water compartments below and tight metal cover is used for conveying all food from the hospital kitchen to the infectious building. This tray is described under the section on Equipment.

Now let us see how we are to dispose of the soiled linens, garbage, and soiled dishes. Under the window in the sterilizing room is an enclosed space with two small doors, flush with the wall on the hallway, and projecting into the room 6 or 8 inches on the inside, with a sloping lid. This makes a small tight compartment about 30 inches high, 18 inches deep, that is, from hall to sterilizing room, and the width of the window. A galvanized iron or porcelain lined tank is made to exactly fit this, with sloping edge inwardly to conform to the sloping lid. There is a hose

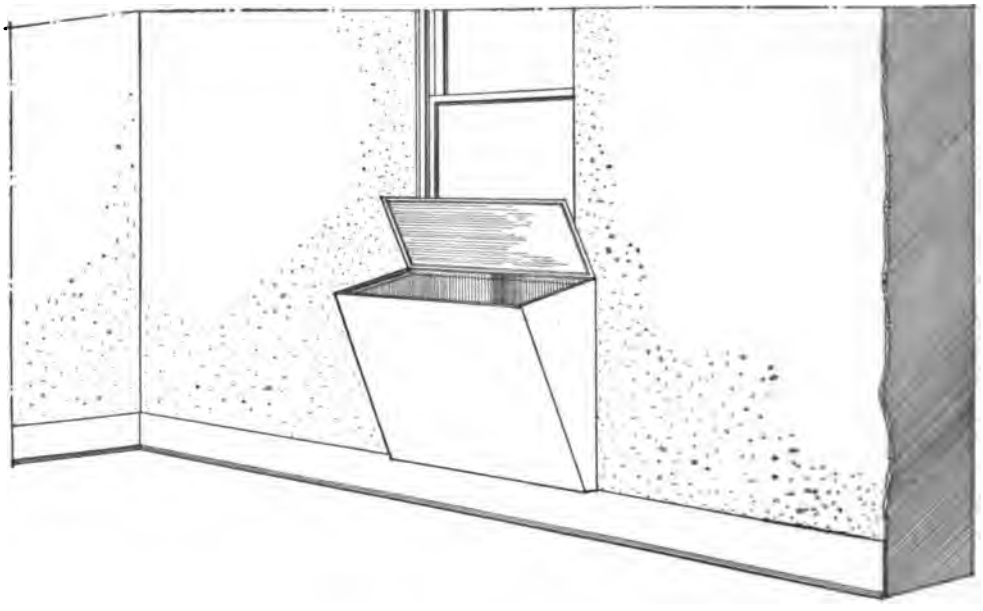


Fig. 159.—Wall receptacle between room and corridor for dishes or linens.

faucet in this large hallway, with hose, to permit the filling of the tanks, and a low zinc-lined sewer inlet for emptying the tanks. It is the clean orderly's business to see that this tank is filled with a 2½ or 5 per cent. carbolic solution each day. When the nurse desires to dispose of soiled linens, she merely lifts her sloping lid to the tank, drops the linen in, and closes the lid. She will not have touched the tank at any point, and the orderly can come twelve hours later, wring out and remove the soiled linens, which have been thoroughly sterilized by this process, take them to the laundry of the hospital, where they can be rinsed in clean water to dispose of the carbolic odor.

In each small kitchen under the window are two tanks half the size of that just described for the linens, one of these to contain the garbage, the other the soiled dishes and the tray.

If the technic is properly carried out in the matter of these several tanks and their usage, it is believed that the sources of infection between the inside and out-

side of the infected quarters will be reduced to as low a point as is possible under working conditions. Fig. 159 shows a view of the mandrell and tank.

In our own particular case the architecture of this building is 12-inch block tiles for the walls, stuccoed on the outside, plastered on the inside with Keene cement, which has the capacity to resist steam, and painted with imported zinc enamel, which also has the capacity to resist steam.

The fumigation and disinfection of this unit after it is vacated is as follows:

Each unit is provided with pressure steam outlet to be used with steam hose sufficiently long to reach the remotest room of the suite. Each suite is also fitted with cold-water outlet to be used with hose connection.

The first step in the disinfection will be formaldehyd permanganate, as prescribed elsewhere in this section.

Second, releasing of live steam, with the operator holding the nozzle by a 6-foot handle, the steam being applied to every part of each room.

The third step is a thorough washing of the walls, floors, ceiling, and furniture with a 5 per cent. carbolic solution, and the final step a thorough rinsing of everything in the unit with cold water.

THE X-RAY DEPARTMENT

THE *x*-ray has made vast strides within the past few years; has been, in fact, revolutionized. Not long ago good pictures of the long bones were the *x*-ray limit. Later on, stone in the bladder and kidney was established as the acme of *x*-ray perfection. Five years ago it was almost an unheard of thing to show on an *x*-ray plate a pus-sac in the antrum, pus in the frontal sinus, and a good sella turcica. An outline of the stomach by the use of bismuth emulsion was considered the last word of *x*-ray practice. We had not then begun to outline the colon in all its length by the use of bismuth emulsions. We are doing so as routine practice to-day. We had not yet thought of outlining tuberculous areas in the lung; we are doing so to-day without comment. The mediastinal glands had not been discovered in the *x*-ray; any passable picture now contains them, and we are to-day outlining calcined tuberculous deposits in the mesentery and abdominal cavity generally. It is no uncommon practice to show malignant tumors about the stomach and intestines. Most of the organs of the abdominal cavity are outlined by the best operators—the stomach, liver, kidneys and spleen, and the bladder—by the use of solutions. Abnormalities of the kidney, pelvis, and ureters are easily demonstrable by the use of collargol, as abnormalities in size, shape, and lumen of the ureters are easily discerned by the use of the ureteral radiographic sound and catheter.

We are going along toward a time when the demonstration of anatomic abnormalities is only a question of mechanical technic in the manufacture of the apparatus and the skill of the operator.

There are two directions of improvement immediately confronting the *x*-ray operator of the day, and in order to achieve this improvement he must work in consonance with the clinician and with the mechanic devoted to the improvement of the *x*-ray apparatus. These two directions are: First, rapidity of *x*-ray execution to the point that will show physiologic movements of the heart, lungs, and intestines, that is, diastole and systole of the heart; the degree of expansion of the lung, and peristaltic movements of stomach, small intestine, and colon. Second, the use of the *x*-ray in the treatment of disease, that is, in the dissipation of tumors that, because of their nature or location, are inoperable; the treatment of skin lesions, such as lupus, favus, and ringworms, and the destruction of highly vascular areas, such as nevus, postoperative keloids, and hemorrhoids, and the dissipation of inflammatory products in certain of the glands, especially in goiter.

It will not be profitable for us to do more than merely mention the above directions in which the modern *x*-ray is moving in institution work, because a further discussion along this line would lead us clearly within the realm of scientific medicine.

Before we go into the question of *x*-ray equipment, let us say a few words about the modern *x*-ray operator. No operator can be a success who does not know sufficient about his apparatus to take it apart and put it together again. He must know the underlying principles operating in all the parts of his machine, the purposes for which each part is used, and the reasons why. He must have a reasonably sure knowledge of the laws of light, so that he will know the *x*-ray,

physically to distinguish it from other ether waves. He should be a good chemist, because the most intricate principles of chemistry are involved in röntgenography. He must be a mechanic of no mean order, because nine-tenths of the x-ray equipment involves mechanical principles; and he must be an electophysicist, because some of the principles involved in the x-ray equipment delve very deeply into the realm of scientific electricity. He should be a photographer, first, because the value of the x-ray plate when finished depends in a very large measure upon its development in the dark room; second, because nearly every institution nowadays does more or less photography, and unless the x-ray operator is a very busy person, there will hardly be any one quite so adaptable for purposes of photography as the x-ray operator.

It goes without saying that the x-ray operator should be a person of liberal medical education, a good anatomist, a good general pathologist, and a good physiologist, to the end that he may be able to aid the clinician in the interpretation of his plates.

It goes without saying that so many-sided a person, one sufficiently versed in so many directions of science to be capable of conducting a modern x-ray laboratory, will be a high-priced individual. Unfortunately, there is no school in which x-ray operation is taught as a course of study in any systematic way, and the x-ray operators of to-day have learned their craft in their own laboratories and in the hard lessons of personal experience. No doubt at some future time there will be chairs in the schools devoted to the teaching of x-ray science. In order to enter such a school, when one is finally established, it will be necessary for the applicant to pass preliminary examinations in medicine, physics, chemistry, and electricity.

Most of the x-ray operators of to-day, in order to earn salaries adequate to the work they do and their mental equipment, must work in their own laboratories, since institutions have not yet come to realize that the x-ray operator is a person entitled to the largest emoluments. There is hardly an institution x-ray operator in the country drawing more than $200 per month, and the average salary is probably not nearly half so much as that.

A good x-ray equipment in a large, liberally patronized institution, conducted at least in part for pay patients, should be a profitable branch of the institution, and the quality of work done by the x-ray operator will be the gauge of the profit, so that it will be a paying investment to employ an operator capable of doing the highest order of work.

Let us now proceed with a very brief description of some of the accepted forms and articles of equipment:

EQUIPMENT OF THE X-RAY LABORATORY

The principle apparatus in the x-ray room, of course, is the current-producing appliance. When the x-ray was first exploited many years ago, the static machine was used to produce a high-voltage, low-amperage current. A little later the induction coil was employed for the same purpose with indifferent success, and then came a period of improvement in the induction coil, until that coil achieved a sufficient size to create a current of sufficiently high voltage to jump a gap of from 12 to 20 inches, combined with a sufficient amperage to create the x-ray in the tubes of that day's manufacture. From that day to this the competition has been keen between the tube makers and those who were called upon to furnish apparatus sufficient to operate the tubes. As the coils of that day were improved in strength and current-producing power. it became necessary to build tubes accordingly, that

is, with a progressively high vacuum to take this current, and this friendly competition brings us down to two or three years ago, when the so-called interrupterless transformer machine was first produced for *x*-ray purposes. This machine is a step-up transformer with revolving switch, which changes the direction of one set of the alternating waves, giving a pulsating unit direction of current, doing away with all inverse current in the *x*-ray tube, and producing a far greater volume than it is possible to obtain with an induction coil. Another advantage of the current thus produced is the fact that, coming in successive waves, it strikes the anode of the tube only, producing more penetrating rays.

This apparatus consists of the transformer, with core, primary and secondary windings, set into an insulating case; a switchboard, provided with means for bearing the strength of the current entering the primary of the transformer, and in this way bearing the output of the secondary. The switchboard also contains the meters for measuring both the strength of the supply current and the high-tension current furnished to the *x*-ray tube, and the switches for controlling the motor that revolves the rectifying switch. On the switchboard also can be mounted the regulating devices for various treatments by the *x*-rays, and the automatic time switch for regulating the time of exposure.

These are fundamental principles of the interrupterless machine, and the details differ only as the machine is built by different manufacturers.

This form of *x*-ray apparatus is practically that approved for modern *x*-ray work, and the old form of induction-coil machine seems to be now relegated to the realm of *x*-ray treatment, which requires less vacuum in the tube and, consequently, less energy to excite it.

The Portable or Tesla Coil.—This, operating directly on the alternating current, requires no mechanical make and break of the spark, alternations of the current serving this purpose, and it differs from the ordinary induction coil in that the secondary winding is inside the primary, and in this way a greater inductive effect is obtained and a current of higher voltage produced.

For light *x*-ray work, and for treatment where a heavier coil is not available, this has proved satisfactory. It is constructed of suit-case size and arranged so that it can be attached to the ordinary light socket.

The next important piece of apparatus in the *x*-ray realm is the table, with tube holder and protective shield. This table consists of an upright with an arm carrying the *x*-ray tube and protective shield which encloses it. This arm is capable of adjustment in vertical or horizontal position, and at the same time the tube may be set at any angle desired. The top of the table has a section covered with material that does not retard the passage of the *x*-ray, and built into the top is an arrangement for almost instantaneously shifting the plates, so that after one exposure another plate which has been protected from the action of the ray will be brought into the position. At the same time the tube is automatically shifted, and in this manner stereoscopic effects can be obtained. The top of the table may be tilted and locked at any angle from the horizontal to the vertical, making pictures in an upright position, so essential for accurate diagnosis of the thoracic and abdominal cavities, the stand also being provided with a means of using the tube underneath the top of the table for fluoroscopic examination, if a separate apparatus for this purpose is not provided. It should be possible to swing the tube-carrying arm around the upright to take a picture with the patient on the ordinary hospital cart, which may be wheeled into position. In selecting a table of this character, particular care should be given to ascertain if it is manufactured in such a way that the tube may be accurately centered over any part.

Stereoscopic Negatives.—A great help in an accurate diagnosis, and one easily made with the table described, is the Wheatstone stereoscope. This consists of metal boxes having ground-glass front, against which the negatives are placed, the illumination secured by electric lights behind the ground glass, and provided with switch for varying the intensity of the light. The boxes are mounted on a graduated track, and so arranged that they can be set equidistant from the center or approximately at the same distance that the radiograph was taken, that is, the distance from the anode in the tube to the negative. In the center of this scale are two mirrors set in such a manner that as the observer looks into the mirrors the pictures are blended, appearing in their natural perspective. In this way the location of foreign bodies is more easily determined and a more natural appearance given to all negatives.

In studying the action of the stomach and intestines a special apparatus may be obtained, so that the course of the test-meal can be actually followed. This appliance consists of a lead-lined box which completely encloses the tube, and has an arrangement in the front of the box for providing an opening of varied size and shape through which the x-ray passes. The patient is placed before this opening, and between it and the fluorescent screen of barium platinocyanid, which fluoresces under the action of the ray. This screen is covered with a lead-glass through which the ray cannot pass, and suitable provision should be made to protect the operator from any of the ray. On this screen the course of the food can be followed as it passes down the esophagus to the stomach. The walls of the stomach are outlined, showing the size and position, the presence of malignant growths, stricture of either the esophagus or the stomach, whether prolapsed or in normal position. The results make it possible to determine the length of time required for passage of food through the pyloric opening into the duodenum and to study contractions of the stomach. The course of the food can be traced through the duodenum.

Practically the same process is employed in outlining the colon by the injection method, using the principles of the high rectal enema. Foreign material can be traced through the small intestine, and this form of procedure can be employed also to a limited extent in locating the precise point of invaginations, strictures, and other obstructions. The fluoroscope screen is also used to a limited extent in determining the functional activities of the heart, systole and diastole, and their abnormalities.

The room in which the fluoroscope screen is located must be capable of transformation into a complete dark room, so that the eye may become accustomed to the finer shades of light and shadow through the screen. An excellent and convenient arrangement of this room is to have two doors with a vestibule between so that outsiders may be brought in without letting in any light. Some operators use a very faint blue light at the top of the room, with push-button or cord at the end for turning off and on the blue light. This blue light can be used for illuminating the room to a certain extent without changing the focusing power of the eye.

There are many small pieces of apparatus designed for perfecting the x-ray in one shape or another. Among these is the intensifying screen, which reduces the time of exposure from 60 to 80 per cent. by means of the fluorescent screen, which is placed in contact with the film of the plate; the pastilles for determining the dose of the ray by the change in color of the pastilles exposed to the action of the ray, compared with a definite color standard; the screen for filtering the ray in treatment work; the various forms of localizer for fixing definitely the location of foreign bodies, more especially in the eye.

Operator's Protective Devices.—Since the era of short exposures, measured in seconds instead of minutes, the damage to the x-ray operator seems to have dimin-

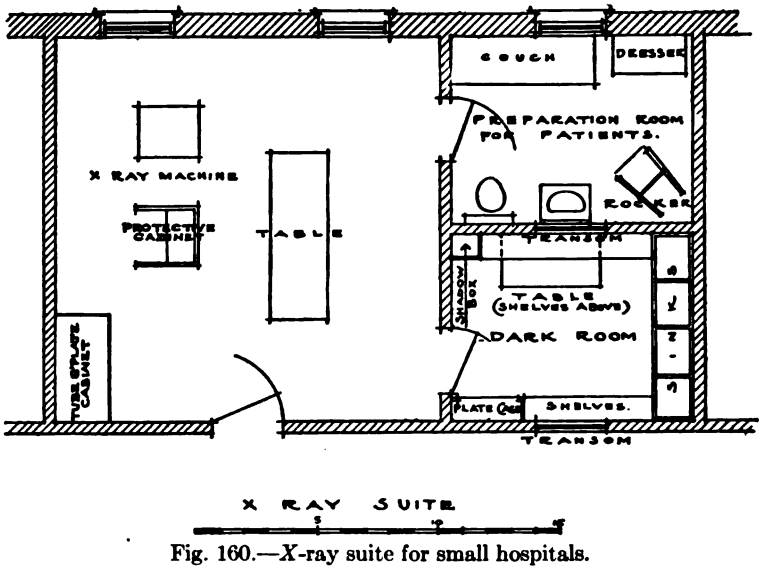


Fig. 160.—X-ray suite for small hospitals.

ished vastly, and we rarely hear now of x-ray burns to the operator, or x-ray affections of the eye, or any part of the operator's person. This is undoubtedly due to

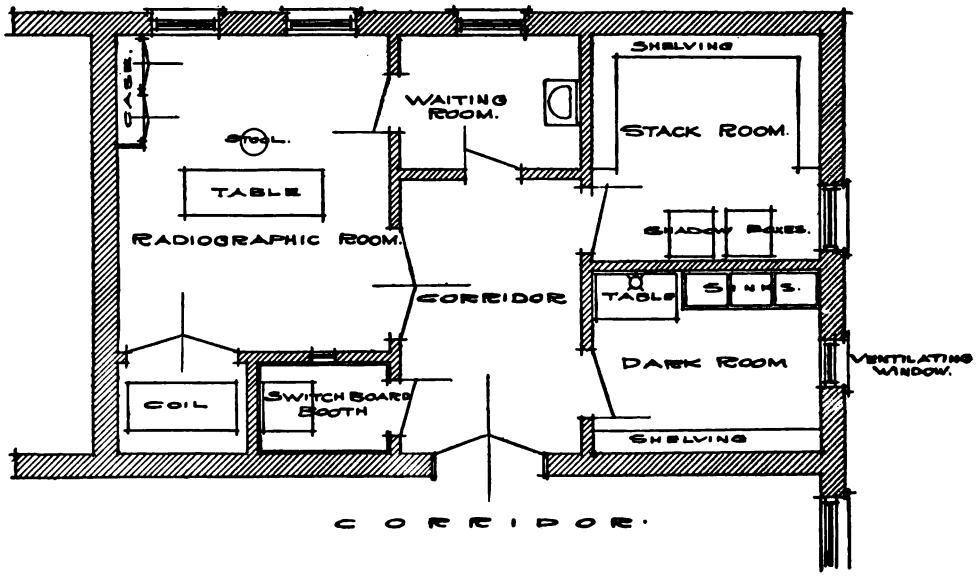


Fig. 161.—X-ray department for small hospital. A most convenient plan.

the shortened exposure. However, it is conceded to be good practice to surround the operator with every device that will guarantee his safety from either primary or secondary x-ray influences.

The first of these protective devices is the cabinet, sufficient in size to protect the person of the operator. It is made of wood, and lined with lead, with peep holes of lead-glass. In this cabinet the manipulating apparatus, switches and so on, must be contained. The location, exact size, and shape of this cabinet can be made to depend a good deal on the topography of the x-ray rooms and the arrangement of the major apparatus. The main point is a sufficiently large cabinet to prevent not only the entrance of the primary x-rays, but those secondary rays that seem to

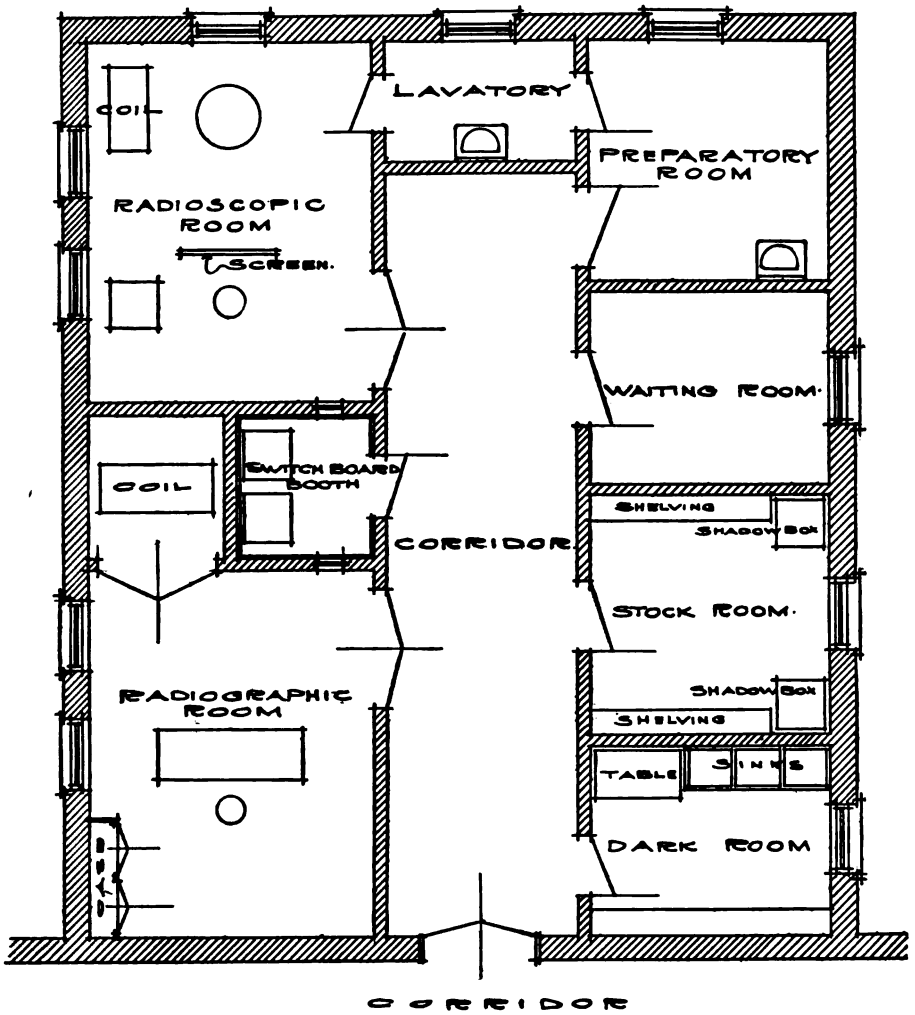


Fig. 162.—X-ray department for large hospital.

come from all sorts of directions—we do not know how. Operators are disposed to grow careless as their experience demonstrates what seems to them almost an immunity. Not very much is suspected concerning the so-called cumulative effect of the x-ray in the matter of its permanent effect on the operator. This field, however, is practically unexplored. The other protective devices for the operator are rubber gloves, rubber shoes, aprons, lead-glass goggles, and movable screen.

PLANS OF THE X-RAY SUITE

The accompanying plans (Figs. 160–162) show three forms of *x*-ray quarters, two for the small hospital, in which practically all the apparatus must be housed in one room, and another for large institutions or private laboratories, in which there is sufficient space available for comfort, ease of operation, and the convenience of patrons.

The possibilities and probabilities of the *x*-ray for the immediate future are so great that those who are planning equipment at present should think about the near future, when an immense, as yet unexplored field will have opened up to the *x*-ray in diagnosis and treatment, and it will be unwise economy to limit the *x*-ray quarters to the needs of the present. Even small institutions will find that their *x*-ray laboratory will increase their income immeasurably by giving sufficient space and installing sufficient apparatus, and employing intelligent enough operators to do all of the things with the *x*-ray that are possible even to-day.

PATIENTS' RECORDS AND RECORD KEEPING

BEFORE we can intelligently discuss hospital rceords of patients, we must fix the limitations and the ambitions of the institution for which the system of records is intended. If the institution is to be content with merely treating the present illness of the patient, and with sending him out well if it can, and is willing to close the book there, then hospital records are not a very serious matter. But such limitations are not to be countenanced in the modern hospital. The cure of disease is not by any means the limit to which the service of a hospital may aspire, and no modern physician will be satisfied to go along from day to day making merely temporary marks on the records of patients, without some well-grounded and very definite ambition to employ these records at some future time in an educational way, and in the interest of the science of medicine. However small the institution, it will, in the course of time, pass through its doors intensely interesting cases, and the medical men who give service in an institution are entitled to at least the reward of permanent records to which they may turn back for use as the years go by.

In discussing patients' records, therefore, we may fairly assume that every institution wants to avail itself of the best systems in points of completeness, brevity, and simplicity that can be devised. We may, therefore, summarize and classify patients' records by stages, and we can then work up to a homogeneous routine practice in record making that will be of real and permanent service, not only in the immediate present and for the benefit of the patient in the case, but to the future of medicine and to the sick for all time. Experience in the treatment of disease and the advances in the practice of medicine are built on patients' records. Let us, then, assume certain fundamental and basic necessities in the records.

First, when the patient comes into the hospital, there must be a history of the case from the very onset of the disease for which he is to be treated, and this history contemplates the family history as well as the personal history of the patient. In other words, the history of a case means the life-story of the patient—physically, mentally, and morally.

Second, we must have the examination of the patient at the bedside, with the physical findings of the physician who conducts the examination, written graphically and in detail.

The modern physician is never content in this day to rest a diagnosis of even the simplest case upon his bedside observations, and requires the aid of the laboratory of pathology. Hence, our third step in the record is the report of the laboratory of pathology, and the value of the examinations in the laboratory may depend, at least in some measure, upon the physical findings and vice versa. In very modern, efficient institutions there is a routine laboratory practice that includes at least a complete examination of the urine, and a complete examination of the blood as a part of the routine of the admission of the patient, and in these institutions there is also a routine examination of the blood-pressure, the hemoglobin content, and a white and red and differential blood-count.

Fourth: We may assume now that we have as accurate a diagnosis of the case, with all the reasons therefor, as it is possible to make without further observation of the patient; and our next step will be a chronicle of the case, written partly by the

attending physician or his assistant, the intern, and partly by the nurse who is taking care of the patient; this we may call the daily routine of the case.

After a time the patient develops, perhaps, some definite disorder, and it is determined to perform a surgical operation, and the record must include the gross pathology revealed at the operation, what was done surgically, how it was done, and what was found.

Because of a tendency on the part of the public to hold surgeons to a strict accountability not only for what they do in an operation, but as to whether or not an operation should have been performed, some institutions have adopted a form of consent to be signed by the patient, or some one responsible for the patient, that shall take the form of an agreement that the operation is necessary, an acknowledgment of its gravity, and waiving damages of every sort in the event of an untoward result; and so important has this written permit for surgical interference become that we may accord it the dignity of a complete step in the patients' permanent record.

But perhaps some tissue—a tumor or other growth—or some abnormal condition may have developed at the operation, and tissue is removed. The case, upon close investigation of the pathologic mass, may seem plain, but the modern practice of medicine and surgery demands that tissue removed in any kind of surgical operation, whether major or minor, shall be passed through the laboratory of pathology and examined as a test of the clinical diagnosis of the case. We have, then, our next stage—the postoperative laboratory report. Following the operation our daily routine is maintained, and if the patient recovers the record will continue until he is ready for discharge, at which time there should be another thorough examination of the patient, physical at the hands of the attending physician, and pathologic at the hands of the laboratory of pathology; at least the secretions and blood must be examined before discharge for purposes of comparison.

But perhaps the patient is unfortunate, and does not recover. Then there is the report of the autopsy.

If we have carried out all these routine practices conscientiously and faithfully, we shall have an accurate report on that patient's case from beginning to end, and it remains now only to file that report in some such form and manner as will make it available either for some purpose of the patient at any future time or in the interest of medical and surgical science; and this brings us to the last stage, or that of indexing, cross-indexing, and filing of patients' records.

HISTORY TAKING

A great many physicians in private practice are methodic enough to request histories of their private cases, and many of them take these histories themselves, after a routine fashion, the result of their years of experience. Most men abbreviate their histories, in a measure, to accommodate the elements of time and space.

In the general hospital, however, the taking of histories devolves upon an intern, or even, in some cases, upon an undergraduate, especially in those hospitals affiliated closely with medical schools. In any event, the history is taken by an inexperienced man, one oftentimes who will not be sufficiently well informed in clinical medicine to place a correct value on a point that may be developed out of his questions, and because of this fact most institutions have framed for themselves a routine form of history taking which may be printed upon a card for the use of the intern. In other institutions this history-taking record is developed in the form of history sheets, and a few institutions have gone a step further still by

printing their history sheets in parts and in different colors, as, for instance, a sheet for the heart findings, one for the gastro-intestinal findings, and one for nervous manifestations, and so on. These refinements of history taking are matters of taste and preference, however, without very much to recommend them, excepting possibly the ease with which the routine may be enforced because of the carrying out of certain of these details. The important thing is the range of questioning to be employed and developments growing out of those questions along lines that may seem promising of results at some stage in the proceeding.

A very useful form of history questions, and one in practice, with very slight variation, in most of the large general hospitals, is subjoined:

Scheme for History Taking

Date, Name, Age, Occupation, Civil State, Nationality, Residence

PRESENT COMPLAINT

1. *Pain.*
   - (*a*) Location.
   - (*b*) Mode of onset—frequency and duration.
   - (*c*) Character—paroxysmal, continuous, dull ache, dragging, lightning-like.
   - (*d*) Radiation—shoulder, back, leg, penis, scrotum.
   - (*e*) Has intensity increased or decreased since onset?
   - (*f*) Severity—severe enough to go to bed; effect of exercise.
2. *Pulmonary.*
   - (*a*) Dyspnea.
     1. Constant or paroxysmal.
     2. Exciting cause of paroxysm.
     3. Relieved by lying on back or sitting erect.
   - (*b*) Cough.
     1. With or without expectoration.
     2. Characteristics of expectoration—color, blood, etc.
   - (*c*) Pain—with breathing. (See under "1. Pain.")
   - (*d*) Hoarseness.
3. *Cardiovascular.*
   - (*a*) Palpitation.
     1. Constant or paroxysmal.
     2. Apparent exciting cause of.
     3. Accompanied by sensation of pain in left arm, back, etc.
     4. Accompanied by dyspnea.
   - (*b*) Edema—of ankles and eyelids.
   - (*c*) Pain in precordium. (See under "1. Pain.")
4. *Gastro-intestinal.*
   - (*a*) Appetite.
   - (*b*) Pain.
     1. Influence of food upon pain.
     2. Number of hours after meals.
     3. Tenderness over (region).
     4. Character of. (See under "1. Pain.")

(*c*) Nausea.
1. Degree.
2. Time.
3. Relation to food.

(*d*) Vomiting.
1. Mucus, blood, food.
2. Taste (sour, bitter).
3. Time and relation to meals.
4. Contents of previous day, etc.
5. Type—projectile, regurgitation, etc.
6. Frequency.

(*e*) Belching—gas, fluid.
1. Sour, bitter, rancid.
2. Associated with pyrosis (heartburn).

(*f*) Dysphagia—subjective sensation, location, pain.

(*g*) Bowels.
1. Constipation or diarrhea.
2. Frequency.
3. Character of feces—clay-colored or tarry stools, ribbon-shaped, odor, etc.
4. Admixture of mucus and blood.
5. Pain on defecation.
6. Tenesmus.
7. Evidences of hemorrhoids.

5. *Nervous.*

(*a*) Headache—occipital, frontal, supra-orbital, helmet.
(*b*) Ocular—ptosis, strabismus, disturbed vision, tension, tenderness.
(*c*) Aural—tinnitus, disturbed hearing.
(*d*) Sensory—tingling, numbness, girdle pain, formication, anesthesias.
(*e*) Tremors—at rest, intention.
(*f*) Paralyses.
(*g*) Vertigo.
(*h*) Gait—steppage, ataxic, spastic, hemiplegic.
(*i*) Mentality—apathy, irritability, memory, speech.

6. *Genito-urinary.*

(*a*) Pain. (See under "1. Pain.")
(*b*) Tenesmus of bladder.
(*c*) Changes in urine—quantity, color, cloudy, bloody, smoky.
(*d*) Passing of stone—gravel or sand.
(*e*) Relation of pain and burning to time of micturition—before, during, or after micturition.
(*f*) Sexual disturbances.
(*g*) Incontinence of urine and feces.

7. *General.*

(*a*) Fever.
(*b*) Chills.
(*c*) Night-sweats.
(*d*) Malaise.
(*e*) Thirst.

(*f*) Insomnia.
(*g*) Jaundice.
(*h*) Loss in weight—how much and during what period of time?
(*i*) Epistaxis.

PAST HISTORY

(*a*) Any antecedent disease like present?
(*b*) Injuries and operations.
(*c*) Rheumatism, scarlet fever, measles, pertussis, typhoid, erysipelas, malaria, etc.
(*d*) History of gonorrhea and its complications.
(*e*) History of syphilis—sore on penis, sore throat, skin eruption, alopecia, miscarriages, etc.
(*f*) Any previous gastro-intestinal, cardiac, pulmonary, or nervous symptoms.
(*g*) Habits—alcohol, coffee, tobacco.

MENSTRUAL HISTORY

1. *Menses.*
   (*a*) When commenced.
   (*b*) Regularity.
   (*c*) Type, duration, and amount.
   (*d*) (See under "1. Pain.")
   (*e*) Discharge.
2. *Pregnancies.*
   Complications following.
3. *Births.*
   Complications following.
4. *Miscarriages.*

FAMILY HISTORY

1. How many dead, and what causes; ages at dates of death.
2. Constitutional organic disease in family and near relatives, such as tuberculosis, diabetes, epilepsy, insanity, etc.

LABORATORY ROUTINE

While we have scheduled the physical examination as the second step in the routine of the patient, most institutions vary this form by routine laboratory examinations made as a part of the admission of the patient, and which are intended to very greatly aid the diagnostician when he comes to the physical examination of the patient; most physicians whose work in the hospital is of sufficient importance to justify the institution in catering to their time and convenience are extremely busy men, and any aid to be accorded them at the hands of the institution administration is in the interest of patients and for the betterment of institution service. The physical examination will, in a great majority of cases, turn upon the laboratory reports that confront the examiner when he first sees his patient in the ward, these examinations having been made immediately upon the admission of the patient, and the reports being available at the first visit of the physician.

Admission No.....

MICHAEL REESE HOSPITAL

Attending Physician.....

Name.....Ward.....Room.....

Interne.....

URINE

Examined by	Date	Time	Amount	Color	Specific Gravity	Reaction	Albumin	Sugar	Acetone	Casts	Cells	Crystals	

BLOOD EXAMINATIONS

KEY: P—Polymorphonuclear Neutrophiles. Pr—Promyelocytes. M—Myelocytes. E—Eosinophiles. L—Large Mononuclears. T—Transitionals. B—Basophiles. U—Unclassified.

Examined by	Date	Hb.	R.B.C.	Index	W.B.C.	DIFFERENTIAL COUNT									Coag. Time	Widal	Wassermann	Culture	Pressure	
						N.	S.M.	L.M.	T.	E.	B.	U.	Abnormal	Stain	Cells Counted					

Fig. 163.—Blood and urine chart, made to cover two weeks, the average stay in the hospital.

Admission No.....

Name..... Ward..... Room.....

MICHAEL REESE HOSPITAL

Attending Physician.....

Interne.....

GASTRIC ANALYSIS

Examined by	Date	Meal	Time: Given	Time: Removed	Time: Analyzed	Am't	General Appearance	Acidity: Free	Acidity: Total	Acidity: Organic	Mucus	Blood: Micr.	Blood: Chem.	Cells	Food	Bact.

FECES

Examined by	Date	Amount	Reaction	General Appearance	Color	Consistency	Mucus	Pus	Blood: Micr.	Blood: Chem.	Food	Cells	Crystals	Bacter.	Ova or Parasites

SPUTUM

Examined by	Date	Amount	Odor	General Appearance	Elastic Fibres	Cells	Bacteria	Crystals

EXUDATES, TRANSUDATES, ETC.

SPECIAL NOTE ACCORDING TO CASE

Fig. 164.—Stomach contents, feces, and sputum chart.

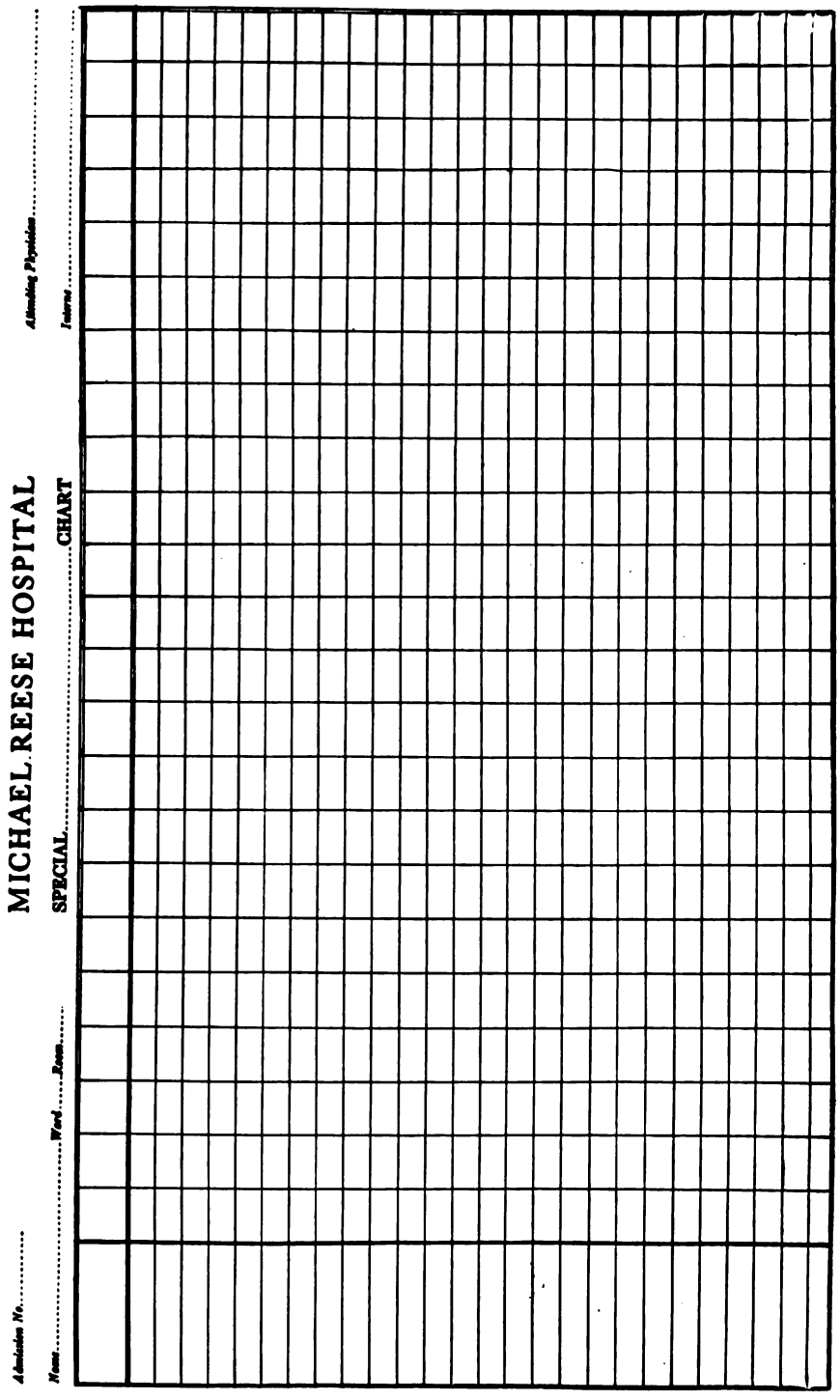


Fig. 165.—Special chart used to tabulate various findings.

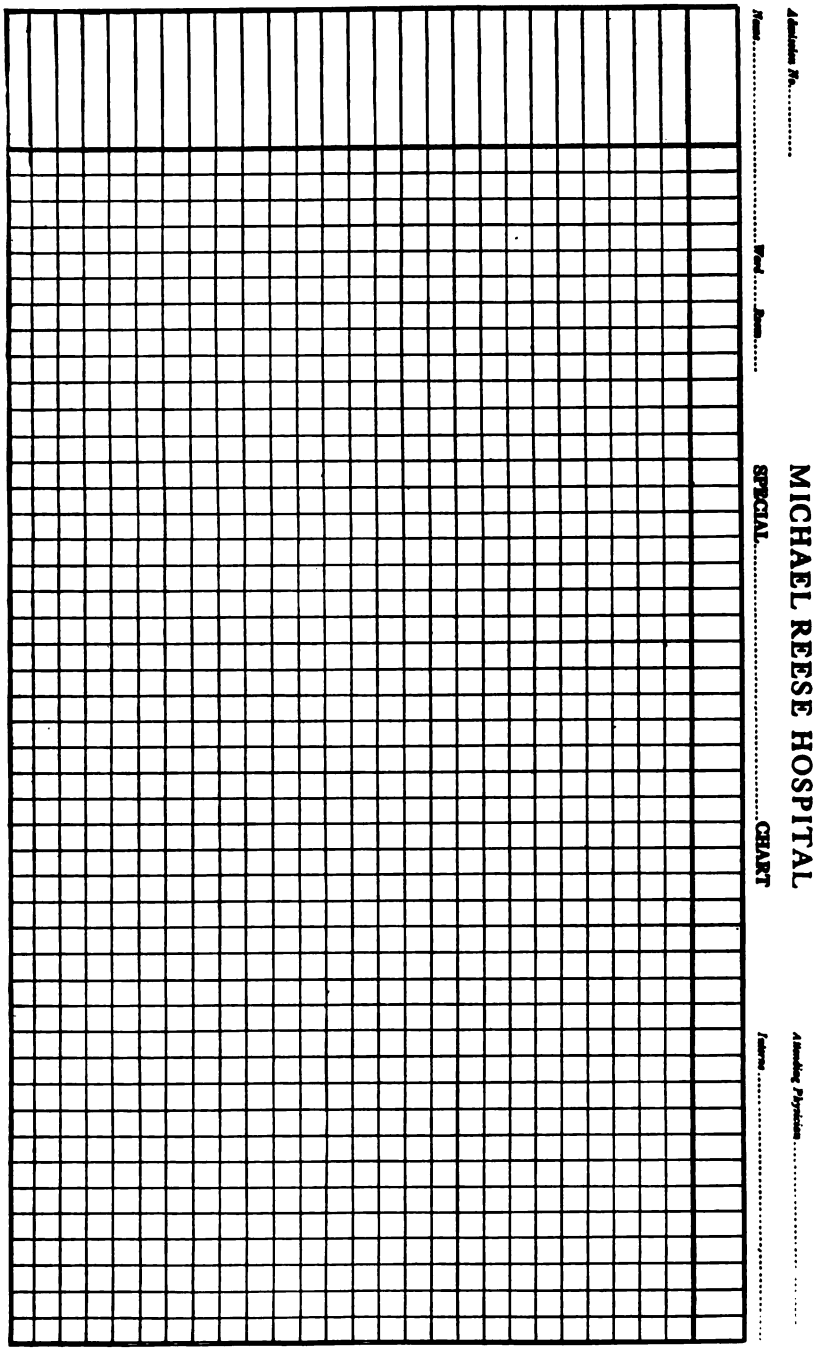


Fig. 166.—Special laboratory chart—for many purposes.

In most well-managed hospitals these admission examinations will include a white and red and differential count of the blood, a hemoglobin report, and a report of the blood-pressure, and in nearly all of the institutions that stand for modern

practice the intern on each service charged with the preparation of the patient for the advent of the attending physician has, as a part of his equipment, the blood-counter, the hemoglobin determinator, and a blood-pressure apparatus.

Laboratory Reports.—In the Michael Reese Hospital a new system of charting laboratory reports has been adopted. It has been assumed, as a basic principle, that the fewer sheets used for this purpose the better would be the results. An attempt to concentrate all reports and at the same time to allow the necessary flexibility has been made by adopting four charts. The first two charts are intended to fill the needs of the ordinary routine work on any cases in the hospital. The last two are used only in special cases.

Figure 163 shows a picture of the blood and urine chart printed on pink paper, so that the visiting physician may turn to it easily. In both of these are printed the headings under which most routine examinations fall, and at the same time there is a space sufficiently large for remarks or extra findings.

In Fig. 164, which is printed on blue paper, is presented a record of gastric analysis, the examination of feces, sputum, exudates, and transudates. The same principle of having headings for the usual findings is adopted in this chart.

Neither one of these charts allows of extension in case of the study of special diseases, and to fill this need very flexible graphic charts are adopted.

Figure 165 shows a very simple chart in which practically nothing is printed. At the left hand a space is left for any orders or any findings that the doctor may wish especially emphasized. It may be in the case of diabetes or nephritis, in which the correlation between the diet and urinary findings are studied; it may be in a case of leukemia, in which daily variations in the blood-count are wanted; or, in fact, it may be any condition at all in which special work is wanted and the course from day to day followed, that such a chart is valuable.

In Fig. 166 is represented simply a sheet of paper containing ¼-inch boxes. This is especially designed for graphic charting, and its uses are really very many. As a blood-pressure chart, as a means of studying the effect of drugs on the pulse, or of diet on the sugar output in diabetes, or in any one of the number of instances of this sort, this chart will show its value.

PHYSICAL EXAMINATION

The physical examination of the patient is the business of the attending physician, who, on the free wards of the average large hospital, yields a part of his prerogative in this respect to some efficient senior intern or member of the house staff, if there be such, and the attending physician contents himself with checking up of intern's examination, unless the case be one that requires a closer scrutiny.

However the examination may be made, and by whom, there is a routine form of report that seems by common consent to be convenient and efficient, beginning with the general appearance of the patient as a whole, and then proceeding with the anatomic divisions of the body until the seat of the disease is reached; whereupon the description of the findings is entered upon exhaustively and in detail. This physical examination may also include the findings of one or more of the specialists called in for the purpose of examining more minutely into special phases of the cases, as, for instance, the eye man may have been asked to look into special eye involvements, or the neurologist may be asked to make an examination of certain suspected nervous or brain manifestations or lesions, and these findings will also be included in the recorded physical examination.

THE DAILY RECORD

Naturally, the daily record of the patient will be in two parts—first, a record of the scientific observations of the physician, and this may be written either by the physician himself or by the intern making rounds with him, and should include any changes that may have occurred in the patient's condition since the last visit, and also include any radical procedures that may have taken place in his case, with the date at which the record is set down, and with the time in hours and minutes, if possible, at which any special thing happened to the patient worthy of record, as, for instance, a transfusion or a surgical operation.

There need be no special form or sheet for the daily record of the patient, excepting that it should be on a hospital heading, uniform in size with all of the other sheets, with ruled lines horizontally, and with a vertical date line on the left margin of the sheet. The value of this daily record will depend upon the conscientiousness with which it is kept up.

NURSING CHART

The patient's nursing chart is a part of the technical training of the pupils in the training-school and should be on a prescribed form and very strictly adhered to, not only in the interest of the patient and his progress, but in the interest of

MICHAEL REESE HOSPITAL, CHICAGO

CLINICAL RECORD

Date_____ Disease_____ Name_____ Physician _____ Nurse_____

				MEDICINE	NOURISHMENT	REMARKS	Urine	DEF.
A.M.								
1								
2								
3								
4								
5								
6								

Summary:

Physicians' Orders

Fig. 167.—Nursing chart.

the training of the pupil nurses. This chart should include the name of the patient, the name of the attending physician, the name of the intern assisting in the case, and the nurse who is taking care of the patient and who is responsible for the chart, and if more than one nurse participates in the care of the patient, then the name of the nurse should be set down at the point of record of the thing that she is reporting. The body of the record should include a space for the date and hour at which the observation is made; the temperature, pulse, and respiration; a place to record the medicine given and the nourishment, with another space for general remarks not enumerated; and, finally, space for an account of the excreta, urine and feces, and at the bottom of the chart there should be a space in which the physician may write his orders for the day. In some well-regulated institutions the old practice is still in vogue of having a separate order book, which is carried

about with the attending physician on his rounds, and in which is written by the physician the order for each patient, with the name of the patient. This practice either entails the copying of the physician's orders so that it may become a part of the permanent record of the case, or it becomes necessary to omit the physician's orders from that record, which is extremely undesirable, because no complete record can be kept that does not include the medicines, nourishment, and special orders given by the attending physician.

These nursing charts are so important that an acceptable form is given on p. 463; each sheet is intended to include two lines for each of the twenty-four hours of the day, and for economy of space both sides of the sheet are used, the printing being the same on both sides, the head of one side becoming the foot of the opposite side, so that charts need not be taken out of the chart-holder to be written upon.

PERMIT FOR OPERATION

It is becoming a common practice of some people, especially the poor and more ignorant classes, to hold surgeons to an unreasonable accountability for their conduct of their cases, due very largely, perhaps, to the fact that so many untrained and incompetent men are attempting to do major surgery; and every technicality is resorted to to make a case against the best of surgeons, if the case happens to terminate badly and some venal lawyer looking for a fee happens to gain the ear of the family of the patient. Many times the patient is justified in his wrath over the result of an operation, because very much crude work and a great deal of unnecessary surgery is being done. It isn't these cases that we are now discussing, however, but the surgical cases of men in our institutions who know what they are doing, and who have done the right thing and have done it well; and in such cases the surgeon is entitled to protection from venality and a species of blackmail.

For a long time such protection has been mooted, and a good many methods have been devised to secure it.

The Michael Reese Hospital has given much attention to this question, and has finally adopted a form of written consent to be signed by the patient, if an adult and in sound mind, and by the nearest responsible relative of the patient if the patient is a child or mentally incapacitated to decide whether or not an operation shall be performed. This permit form has been submitted to some of the best lawyers, and all of them agree that it has immense force as a moral deterrant, and some of the ablest men in the legal profession have pronounced it a legally binding instrument; at any rate, since it became the routine of the hospital to demand a written permit preceding every surgical procedure, there has not been an opportunity to test the validity of this permit form, because no case has ever gone into court against the hospital or its surgeons.

When this permit was first proposed there was objection to it on the part of some of the surgeons, who felt that it would frighten patients or their friends to the extent of making them refuse an operation. The results have not borne out this fear, and when it is explained to a patient or a relative that such a permit is demanded, even in the very simplest case, merely in order for the institution to be absolutely certain that no one is going to be operated upon without his or her consent, objections have fallen away, until now it is definitely understood by surgeons, physicians, patients, and the public that the hospital will not allow any one to be operated upon without a written consent, not even if all the family, including the patient, express a willingness to have the operation done.

Occasionally a patient will be brought to the hospital whose physical condition is extreme, and likely to be rendered even worse by any such mental disturbance as

a proposal that he or she sign a permit for a surgical operation, and it is occasionally proposed that some member of the family be allowed to sign the permit instead of the patient, although the patient is in perfect command of his or her faculties. But this is never permitted, even in the extremest case. The patient, and the patient only, must say whether he or she will be operated on, because in the event of recovery the patient may fall back upon the insistence that he never gave his consent to the operation, and that no one's else consent served the purpose, and this is a good legal argument, and lawyers say "would hold in court."

Occasionally a patient is brought to the hospital in a critical condition, perhaps from an injury on the street, and requires that an immediate operation be performed. The patient may be unconscious, and no friends at hand. Perhaps the patient is even unidentified. In such a case as that it would seem that every legal requirement, and certainly every moral requirement, would be fulfilled if the case were referred to the superintendent of the institution, who would exercise the discretion of allowing the surgical operation to proceed; and in such a case a written statement should be made a part of the record, and signed by the superintendent of the institution, who assumed the initiative, setting out the facts in the case and stating why it was necessary that the operation be immediately performed without the routine written consent to that effect. If such a case ever got to court, the judge and jury would at least be thoroughly convinced that the institution had carefully weighed the whole situation, and that whatever was done was done in the interest of the patient after mature deliberation; and the presentation of such a case would have a very great moral value and the patient would not have suffered at all.

This permit for operation is signed by the patient in any language that he or she can write, and the signature is witnessed by at least two persons.

This form of permit is made up in books of two hundred sheets, one hundred on white paper, which serves as the original, and one hundred on pink paper, that is used for a carbon copy. After being filled out and signed, the original is torn out of the book, and is attached to the record of the patient, and goes to the operating-room as a part of that record, and it is the routine practice not to allow a patient to be anesthetized or prepared for the operation until the permit is presented to the head nurse, or until a written waiver from the superintendent of the institution is presented as a substitute.

The form of this permit is given herewith:

.....19.....

I, the undersigned,.....a patient at the.....Hospital, hereby certify that I have full knowledge of the operation to be performed upon me under the direction of Dr.....; that I have given and do hereby give my express consent thereto, and in consideration of the performance of the said operation by said Dr....., and in further consideration of the facilities therefore granted me by the..... Hospital, I, the undersigned, do hereby release the said Dr.....and the said .....Hospital from any and all claim of any kind and nature that I may now have or that I may have against them or either of them at any time hereafter as the result of the said operation, or because of the same or because of anything arising in connection therewith.

Witnessed by: .....

.....

.....

HISTORY OF OPERATION

The history of a surgical operation, the nature of the procedure, and the gross pathology of the case will be of value as a permanent record of a patient only if it is

written out immediately after the operation is performed. The memory of a surgeon or intern, who may perhaps be operating on several cases in the same day, is too unreliable to admit of any delay in such an important matter. It is almost an utter impossibility to induce surgeons to write the history of their operations, and there seem to be one or two expedients by which this important data may be had. One of these methods is to have the history of the operation written by the surgeon's assistant, that is, usually the intern. The other recourse, and one which is in force in a few of the larger institutions of the country, is to keep a stenographer in the surgical suite at all times when surgical operations are going on. The surgeon who has completed an operation can tell the history while he is changing his clothing, and will almost invariably be willing to do so, and even when a surgeon has performed several operations one after another during the morning, each one will be so fresh in mind that he will have no difficulty in dictating a sufficient history to entirely and acceptably cover the case. Such a history as this, dictated by the surgeon, is of vastly greater value than when it is written by an intern, first, because the intern will be busy all day, and can hardly have time to write the history until night, and unless there is some special incentive, either in the case itself or in the discipline of the institution, the history will be cut so short that its value will be greatly impaired.

After its completion, the history of the operation may either be attached at once to the rest of the record of the case, or it may be sent to the library to be attached upon the discharge of the patient. Sometimes patients exercise a morbid curiosity about themselves, and even where there is no intention whatever to deceive them as to what was done, the seriousness of the operation grows as a patient reads the details in the record, and in some cases it may have a really disturbing effect, and it is the practice of some surgeons to request that the history of the operation be withheld from the record for this reason.

The form of the history of the operation is one of preference; but it would seem that the most useful and immediately available form is a graphic story step by step of what was done, where the operator went, what he found there, and what he did about it. The story would seem to begin with a statement as to the kind of anesthetic employed, whether ether, chloroform, or gas-oxygen, and the time consumed. The preparation for the operation may be stated as "the regular routine preparation," or in the event that there was some departure from the routine technic of the institution, it ought to be so stated, then the operation ought to be repeated step by step, including the incision in the skin, and information as to whether or not the same knife was used in going through the skin and making the necessary subsequent incisions, because we know that infections may occur from the use of the same knife; the kind and size of ligatures and sutures must be stated; if considerable vessels are ligated it ought to be so stated, and if a nerve of consequence is disturbed, that ought also to be mentioned, and the nature of the disturbance; each tissue passed along the route to the source of the trouble ought to be at least mentioned, with any findings out of the normal; then the operation, that is, the actual remedial work, ought to be covered in detail, the removal of a tumor, its general appearance, color, size, its topography, its relation to surrounding tissues, its circulation and nerve supply, the character of its pedicle, and its origin, the technic of its removal, and then quite as great care and elaboration will be necessary in leaving the field of operation as in entering it.

The history of the operation ought to include a definite, detailed statement as to the patient's behavior under the anesthetic and during the operation, and the condition of the patient when put to bed.

FILING AND INDEXING OF RECORDS

The discharge of the patient is a rigid piece of technic. Naturally, the physician in charge of the patient's welfare ought to say when the patient is ready to go home, and that order should be expressed by the physician in his own handwriting somewhere, and the best place for the order of discharge is on the small admission card which accompanied the patient to the bed to which he was assigned, and which has been a part of his record all through the institution, and under the heading provided for "discharge." The next step is the gathering of the clothes and whatever valuables the patient may have had on entering the hospital. There is a clothes list and a list of the valuables, and these should be taken to the business office of the institution at the same time with the completed record of the patient. The clothes list is checked by the office, so that the orderly may get the clothes from the locker-room custodian, and the valuables are turned over to the head nurse on surrender of the receipt.

It is the record only, however, that we have now to deal with, the balance of the technic being followed more in detail under the heading of the business office and its affairs. The small admission card attached to the record is stamped with the day and hour of the discharge of the patient, and may then be regarded as a closed incident in the affairs of the institution, and it is immediately sent to the record library for its final filing; the large admission card, which has remained in the office, being used to close the patient's account in the books.

A great number of systems have been tried, and nearly every institution in the country that makes any pretense to keep correct records has evolved some system of its own for the preservation of its records in such manner that they can be drawn upon for use for any purpose. Without going into these various systems and their strong points and weaknesses, we may launch at once upon a very brief discussion of that general system which seems to meet with almost universal favor, either in whole or in some modified form applicable to special situations.

There is, first, the small admission card which we have carried all the way through, and which now becomes the index card filed alphabetically under the name of the patient, so that inquiring friends of the patient himself may at any time have access to his record by means of his admission card and its accompanying number.

Then there is the topic of the disease from which the patient suffered, pneumonia, for example, and a card is filed in the disease section of the index in that way:

PRINCIPAL DISEASE OR OPERATION

COMPLICATIONS

NAME NO.

DATES AGE DR.

CONDITION

Third, there is a card indicating the organ of the body affected, that is, the organ which was the chief seat of the patient's disease. In the illustration which we have already taken the organ would be the lungs, so that the third card is filed under the heading of "lungs, disease of":

ORGAN AFFECTED

PRINCIPAL DISEASE

NAME AGE NO.

DATES DR.

CONDITION

And there is finally a fourth card which may be used to describe any complication of the disease which would seem to have a direct bearing on the case. Let us carry along our illustration and say there was an effusion, so that a card would be made out for "effusion," complication of pneumonia:

COMPLICATION

PRINCIPAL DISEASE

NAME AGE NO.

DATES DR.

CONDITION

If this index system is faithfully carried out, we will have in the card index all the information we will ever want concerning the patient, and by means of the name and number have access to the record which is filed away, and in addition to that we shall have a means of directing the inquirer to whatever he wants for literary

purposes. Let us say, for instance, there is in preparation a paper on pneumonia, and all the literature that the house affords on the subject of pneumonia will be required; the card index will give a list of the pneumonias covering the whole period of the hospital's existence. But suppose the information desired covers all diseases of the lungs; then, under the heading of "lungs" these pneumonias, as well as all other pulmonary diseases, will be found. But let us suppose that it is none of these that the inquirer seeks, but that he is writing on the subject of effusions of various sorts and in various localities in the body. Then, under that heading, he will find the "effusion" as a complication of pneumonia recorded in this particular case. It is not necessary that these second, third, and fourth index cards shall go into the matter at great length, but that they shall merely refer to the case as shown in the illustration. Sometimes the case may require half a dozen cross indices, and these ought to be carried out faithfully, if the medical men in the institution are to have the best possible use of the literature accumulated as the years go by.

For instance, let us take just one case and see where it will lead to: We have John Smith coming to the hospital with an advanced case of appendicitis which has ruptured, and a peritonitis has already commenced. The patient is operated upon, and in the course of two or three days develops a hypostatic pneumonia. The patient is constantly losing ground, and finally develops an empyema, and eventually dies, largely because his resistance has been destroyed by the diseases and their complications from which he had suffered. Now, there are many things of importance in this case that should be preserved in the records. Naturally, there will be a card for the appendicitis, and a cross-card for the peritonitis, another card for the pneumonia, and still another card for the empyema; yet all of these diseases have been complications of the appendicitis, and should be scheduled as such complications, although they are definite diseases, and might have been an original lesion.

In some institutions the records are kept with a view to annual reports, so that a long list of diseases may be published as a part of the showing of the hospital for the year, but there is no other reason why the whole index system of the institution should be warped for a purpose that can be met in the course of two or three hours' work by going over the superintendent's diary, which gives the diagnosis of the case at the end of the discharge column.

In some of the large general hospitals there is an attempt to maintain a separate card index of records for each department—one for medicine, one for surgery, one for pediatrics, one for maternity, and so on. It would seem, however, that this system may cause great confusion. For instance, a child is brought to the hospital and admitted to the medical department. In the course of time he develops a surgical disease and is operated upon. Some nose or throat lesion may supervene, and the patient is operated upon again in another department. So that we would have this patient running through several departments of the hospital, and in each department there would be an index and cross-index, and thus the system could be elaborated to a point of topheaviness that would not be carried out, and hence would be worthless. The maternity department is just a little different, and the modern up-to-date obstetricians are so eager in their acquirement of special knowledge based upon large series of cases that it would almost seem desirable to maintain for them a separate index which need not be pathologic at all, as, for instance, they may want an index of placentas, an index of pelvic measurements, or an index of blood examinations of mother and child. Especially is this the case just now, when the obstetricians are invading new fields of investigation, and they are entitled to all the help that the institution can give them in their researches. But,

barring this one department, there seems no legitimate reason why the indexing of records ought to make any complications excepting as outlined above.

In some institutions color cards are kept, one for the organ, one for the complication, and so on. But these also would seem to be superfluous, and they merely serve the purpose of littering up the system.

There should be four compartments in the filing cabinets or rather, perhaps, four independent cabinets—one for the name of the patient, one for the disease, one for the organ affected, and one for complications.

Boxing of Records.—The keeping of records permanently is a matter that has caused a great deal of trouble and is not yet settled. There are objections to every system in use; the question is, Which one seems to present the fewest objections? In the large Eastern institutions the records, as a rule, are bound and filed

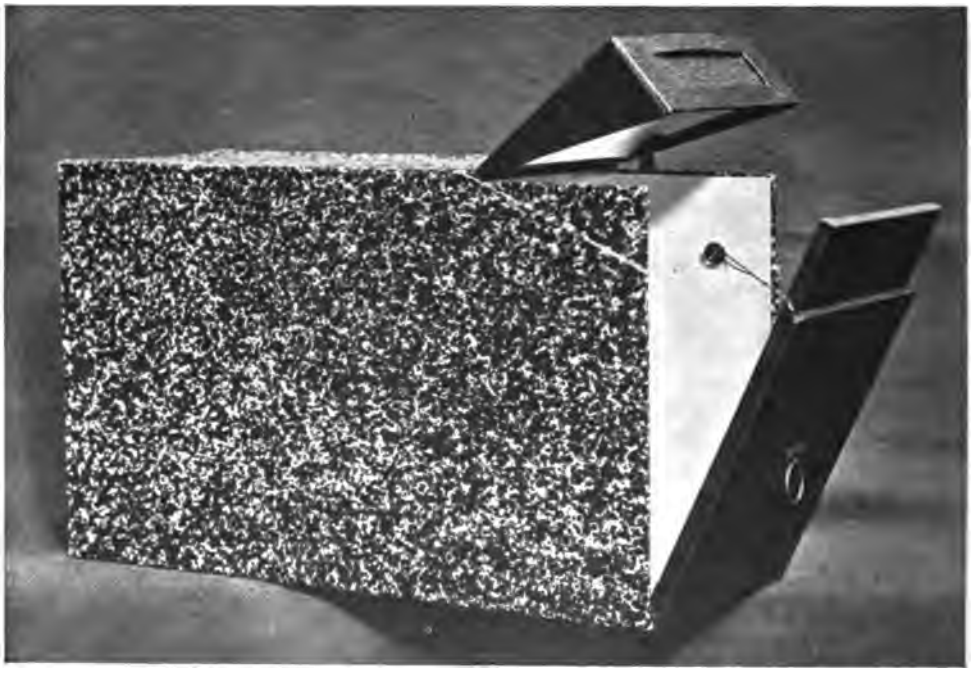


Fig. 168.—Record box.

in book form, and so are kept neatly, and with a view to ready reference; but it may be very seriously doubted whether this system is one best calculated for the convenience of the medical men working in the institution. For instance, a patient comes to the hospital a second time, and the old record is wanted, not only for the purpose of reference at the moment of admission, but as a continuous reference during the patient's stay in the institution; in such a case it would seem necessary to attach the old record to the new, and so keep them together; the bound-book form would not lend itself to this convenience, and the difficulties presented in such a case would seem to be a sufficient advocate of an independent resting-place for each patient's record. Figure 168 illustrates such a convenient record box.

The sheets of the record in fastening should be placed in the order of their occurrence in the patient's history. The history sheet first, because that is taken first, the physical examination second, the laboratory findings on admission next,

the first page of the nursing chart to follow, and then, in the regular order, the incidents of the case. The individual records are fastened together by wire staples and are placed in boxes, 100 in a box, in numeric sequence, so that any record can be found in a moment by simply running over the corners of the 100 records.

Who Shall Have Access to Records?—The question of who may have access to the records of a patient is an ever-perplexing one in every institution. In some hospitals any one may see a patient's record and use it in any way he sees fit; and in most places the members of the medical staff may have access to any record they care to consult without reference to the purpose of the consultation; but in carefully conducted institutions, especially in the large cities, where there are complications having to do with corporations, such, for instance, as injuries to patients and illness caused by conditions of work, there is a very definite rule prescribing who may have access to records and the purposes for which records may be consulted.

The business of a patient is supposed, in the ethics of the medical profession, to be sacred, and no physician of repute will discuss his patient's private affairs, including his physical state, with any one, and especially with any person likely to make hurtful use of the information. It would seem that a hospital should occupy the same relative position toward a patient, that is, that the affairs of a patient are sacred to the institution, and that they should be preserved privately and kept inviolable, except on the definite order of a court that they be revealed.

A patient has a right to his own record and to the use of its contents, notwithstanding some physicians take the ground that a patient who changes doctors has no right to a record of a former illness as kept for or by some other physician—in other words, that the physician is not in duty bound to give any information for the benefit of some other doctor. It would seem that a broader view is that the patient is entitled to whatever information may be necessary in the treatment of his illness, notwithstanding the fact that he may have changed physicians or changed hospitals. Some physicians act upon the presumption that hospital records belong to them for any purpose for which they care to use them, whether the use be in the patient's interest or in the interest of some corporation which the patient is suing. The humanitarian view, however, and the fairer view would seem to be that the attending physician of the patient has no more right to the use of a record for improper purposes than anybody else has, and it goes without saying that the use of a record against a patient for legal purposes is an improper one, and ought not to be tolerated by any institution or allowed, either at the hands of a member of its medical staff, or an outside physician, or an attorney of a corporation. There are a great many hospitals in the country that allow themselves to be used by corporations, and not a few have definite contracts with corporations for the care of patients that they may send, one of the clauses of which contract prescribes that the corporation may have its own physician in attendance on a patient, or, in case the patient has his own physician, that the corporation may have access to the patient at any time. This means, in plain parlance, that the corporation has a right to the iniquitous and criminal practice of forcing settlements out of sick people, a position wholly untenable, and one that is a public scandal in many parts of the country and in many institutions. In the best conducted hospitals it is the practice to refuse admission to corporation lawyers, corporation doctors, and corporation claim agents of whatever character or degree of eminence; and in these institutions it is definitely understood that the patient is in the care and sacred custody of the institution, with a view to the curing of his illness or the healing of his hurt, and that the transaction of any business of whatever nature will not be permitted at any time during the patient's sojourn in the institution,

without his explicit consent and wish expressed at a time when he is in perfect command of his faculties untempered by bodily or mental pain.

This subject, however, brings up another delicate point, that is, How far is it the duty of an institution to go in connivance with a patient to perpetrate a fraud? There are a great many people who live by their wits, that is, by the bringing of damage suits against corporations for personal injuries, with a view to a settlement for some small account to be divided with a pettifogging, conscienceless lawyer whose livelihood is gained in the same way. For instance, a patient spends a season in the hospital, leaves the institution, and brings suit against a corporation on the ground of personal injury, citing his stay in the hospital as the expression of this injury. Cases are almost numberless in which patients have sued corporations for injuries that existed years before the alleged accident occurred, and the records of the hospital would show such previous injuries or illness. There was a case in point not long since in which the corporation counsel for a large city requested a record of a patient, which was refused on the ground that the record was proposed to be used in a legal interest inimic to the patient; in other words, to defeat the patient's attempt to gain a damage suit for personal injury. The corporation counsel appreciated the institution's view-point, but made the counter proposal that if he were able to show that the patient had sued five different corporations at various times for the same injury, and that the injury itself had occurred long before any of the suits had been brought, then the institution ought to waive its point and reveal the contents of the record. The attorney for the hospital agreed to this contention, the use of the record was allowed, and the patient's case thrown out of court with severe censure by the sitting judge.

There is no doubt that the record of a patient ought to be at the disposal of medical men for the purpose of their literature, and such use of records can be permitted very easily, even to the extent of allowing the physician to remove the record from the hospital by the mere routine signing of a receipt for the record, and such receipt ought to state the number of pages in the record, not with a view to inhibit the mutilation of records, because we have a right to assume that no reputable physician would mutilate a record in his keeping, but in order that one or more pages may not be lost during its absence. But physicians should not have the use of records for legal purposes under any circumstances whatever. That use of a record ought to be confined to the institution itself. In other words, if a physician who has treated a patient in the wards of the hospital is asked to testify in a subsequent action at law, it ought to be his duty to state definitely that he does not remember the facts of the case, provided, of course, that is the truth, and that these facts are in the custody of the hospital, and that the contestants should take the matter up with the institution authorities. If it has been a private patient of the physician the case is somewhat mitigated, but in such a case the doctor will probably have his own private record with which to refesh his memory, and if he has not, then the case has not been sufficiently his own to justify his use of the records independent of the institution.

One of the nuisances of the modern medical record library is the constant requests for copies of records, and the question is, Is the institution obliged to furnish these copies, and, if so, should there be a charge for them? In nearly every case of requests of this sort the record is wanted for purely medical purposes, and it is wanted usually for the use of some physician who is treating a present illness of the patient; so that what is really wanted is the diagnosis in the previous illness, an account of any surgical operation that may have been performed, and usually a very short synopsis of the case dictated by some medical authority of the

institution will serve all of the purposes; if a complete record is wanted, however, it would seem that the patient ought to pay at least for the time of the clerk in preparing it and for the trouble incident to the copying of the record.

X-ray Records—How Kept.—X-ray records are rather different from other records of patients. They are, as a rule, pictures of localities of the human body, and usually well-defined localities, such, for instance, as a shoulder, hip-joint, kidney, bladder, gall-bladder, or head, and it would seem, therefore, that there may be two index cards only, one giving the patient's name, so that the plate or print may be found, and the other, the locality taken; this for purposes of the literature and to enable medical men to study, if they like, a series of plates of some particular locality.

There is also an anatomic index carried along with the above, which will make it possible for the librarian to pick out sectional plates, so that the physician or surgeon can study a region and compare normal plates with possible abnormalities which he is studying. This index is carried along with and becomes a part of the other index.

Following is a schedule under which it would seem that nearly any x-ray plate could be indexed, and in daily use this schedule has been found to meet practically all the requirements, and permits of an easy and rapid finding of whatever is wanted.

INDEX FOR X-RAY PLATES

1. *Arteries and Veins.*
   (a) Aneurysm.
2. *Arthritis.*
3. *Bismuth Test-meals.*
   (a) Colon.
   (b) Small intestine.
   (c) Stomach.
   (d) Rectum.
4. *Calculi.*
   (a) Cholelithe.
   (b) Enteroliths.
   (c) Phleboliths.
   (d) Renal.
   (e) Urethral.
   (f) Vesical.
5. *Defects and Deformities.*
   (a) Cervical rib.
   (b) Scoliosis.
   (c) Spina bifida.
6. *Dislocations.*
   Acquired:
   (a) Ankle and toes.
   (b) Elbow.
   (c) Hip.
   (d) Jaw.
   (e) Knee.
   (f) Shoulder.
   (g) Wrist and fingers.
   Congenital.
7. *Experimental.*
8. *Foreign Bodies.*
   (a) Abdomen.
   (b) Foot.
   (c) Hand.
   (d) Miscellaneous.
9. *Fractures.*
   (a) Clavicle and scapula.
   (b) Carpus, metacarpus, phalanges.
   (c) Femur.
   (d) Humerus.
   (e) Pelvis.
   (f) Radius and ulna.
   (g) Ribs.
   (h) Skull and face.
   (i) Tarsus, metatarsus, phalanges.
   (j) Tibia and fibula.
10. *Heart and Pericardium.*
11. *Intestines.*
12. *Miscellaneous.*
13. *Mastoid Disease.*
14. *Normal.*
   (a) Abdomen:
      Kidney region.
      Middle region.
      Pelvis.
   (b) Bones:
      Clavicle and scapula.
      Femur.
      Humerus.
      Tibia and fibula.
      Radius and ulna.
   (c) Chest:
      Lungs and heart.
   (d) Heart:
      Sinuses.
      Mastoid.
      Sphenoid, etc.
   (e) Intestines.
   (f) Joints:
      Ankle and foot.
      Elbow.
      Knee.
      Shoulder.
      Spine.
      Wrist and hand.
   (g) Stomach.

15. *Osteomyelitis, non-tuberculous.*
    (*a*) Bones of face.
    (*b*) Lower extremities.
    (*c*) Upper extremities.
16. *Periostitis.*
17. *Pleura.*
    (*a*) Empyema.
    (*b*) Pneumothorax.
    (*c*) Serous effusion.
18. *Stomach.*
    (*a*) Dilatation.
    (*b*) Gastroptosis.
19. *Sinus Disease.*
    (*a*) Antrum.
    (*b*) Frontal.
    (*c*) Hemisinusitis.
    (*d*) Pansinusitis.
    (*e*) Sphenoiditis.
20. *Syphilis.*
21. *Tumors.*
    (*a*) Brain.
    (*b*) Carcinoma.
    (*c*) Exostosis.
    (*d*) Sarcoma.
22. *Tuberculosis.*
    Soft tissues:
    (*a*) Lungs.
    (*b*) Serous membrane.
    (*c*) Kidney.
    (*d*) Glands.
    Bones and joints:
    (*a*) Bones of face.
    (*b*) Hip.
    (*c*) Lower extremity.
    (*d*) Upper extremity.
    (*e*) Spine.

ANATOMIC INDEX

Abdomen:
    Gall-bladder region.
    Kidney region.
Ankle.
Arm.
Chest.
Clavicle and scapula.
Forearm.
Foot.

Head:
    Lateral.
    Mastoid.
    Posterior.
    Anterior.

Hip.
Knee.
Leg.
Pelvis.
Ribs.
Shoulder.

Spine:
    Cervical.
    Dorsal.
    Lumbar.
    Sacrum and coccyx.
Thigh.
Wrist and hand.

Each plate should have a label, with the name of the patient, the date, the name of the physician who ordered the plate, the anatomic region taken, and a number, which number must be carried through the *x*-ray index and made to indicate the size of the plate by a decimal point or otherwise, so that it can be found easily on the shelves. For instance:

HOSPITAL *X*-RAY DEPARTMENT

DATE.....
NAME.....
ADDRESS.....
DOCTOR.....
DIAGNOSIS.....

In some of the courts of the country it has been decided not to accept *x*-ray pictures at all, but in some courts *x*-ray plates are accepted when the plates can be definitely identified with the patient at issue in the legal proceeding. In order to meet this requirement, some institutions have adopted a process of metallic ink writing, that is, they write the name of the patient and the date in a special chemical ink upon a small piece of paper, and this paper is pasted on the envelope in which the plate is concealed. When the picture of the patient is taken, the name and

date, as written on the scrap of paper, appear as a part of the picture, and in some courts at least this identification has been accepted as valid.

Perhaps the best method of preserving identification of a plate is by the following process: A piece of paper, say, 3 inches long and 1 inch wide is glued with label glue. A piece of tin-foil 2 inches long and 1 inch wide is pasted on this in the middle, so that the glued paster projects ½ inch at each end. A machine that can be easily purchased on the market is used to stamp out the patient's admission number in the hospital and the date. This date stamp, instead of having rubber numbers, has steel figures in the shape of a die. The operator simply cuts out the admission number of the patient and the date, perforating both the paster and the tin-foil which is glued to it. This small sheet is then fastened to the envelope of the plate, so that when the picture is taken that part covered by the tin-foil will be unaffected by the *x*-ray, and the perforated figures will be acted upon. When the plate is developed these figures will show plainly, and the records of the hospital can be used to identify the patient by the admission number. Undoubtedly this device can be applied also using a larger stamp, with the letters of the alphabet in place of figures, and the patient's name can be spelled out or the initials can be given. This form of identification works satisfactorily in the Michael Reese Hospital. The radiologist's signature can be written in common ink on the plate as his own personal mark, and merely to indicate to inquirers who did the work. This signature is not necessary to identification of the plate, however.

The interpretation of *x*-ray plates is complicated and quite a technical matter, and skill in their interpretation only follows great experience and long study. In most modern institutions the *x*-ray plates are kept in the neighborhood of a shadow-box, so that if a surgeon has an interesting kidney picture that he wants to study, and if the plate of the case at issue seems to present some new detail with which he is unfamiliar, it is an instructive and valuable thing for him to be able to sit down before a shadow-box with a large number of other kidney plates for comparative study, and so with all of the other localities of the body comparisons are of great advantage. It is a valuable acquisition to any institution to have on hand a great number of shoulder-joint plates, a great number of kidney plates, a great number of frontal sinus plates, and so through other anatomic regions of the body, as recognized in *x*-ray photography.

Who Shall Have Access to *x*-Ray Plates?—Very frequently patients who have had fractures, the results in which have not been quite satisfactory, will want to consult their *x*-ray plates at the institution, sometimes with a view to legal action against the physician; sometimes patients who have had an *x*-ray picture taken at the instance of one physician may want possession of the plate with a view to consult a second physician about the case; sometimes a patient may have placed himself in the hands of a second physician who will want to see the *x*-ray plate taken on the order of a physician who had previously treated the case, and in any of these events the situation of the hospital is rather embarrassing. Most institutions take the ground that the *x*-ray plate is the property of the institution, and that the patient has paid not for the plate itself, but for the information it contains for the use of his physician; and in some institutions a print of the *x*-ray plate is offered as a substitute for the plate itself, the institution insisting upon retaining possession of the plate as a part of its records, and, naturally, for the purposes of the literature, just in the same way that the institution would allow the patient to have a copy of a record of his case, but would refuse to turn over to him the original record itself. This contention is not very well received by people who have paid a large price for an *x*-ray plate, but nevertheless it is maintained in some institutions, although

it very often happens that a photographic print of a plate is not a very serviceable substitute.

In the dilemma as to the right of the various contesting interests to the possession of the plate or a print of it, we may fairly assume the same attitude as we did in the case of the record of the patient. The patient himself ought to have access to his *x*-ray plate and whatever information it contains, and it goes without saying that the sacredness of the relation between the patient and the hospital ought to inhibit the use of that plate by any one at variance with the patient's interests. In other words, it would seem to be a fairly safe course to refuse the picture or a print of it or any information contained in it to any one except the patient himself, or some one to whom the patient has given a written order.

SOCIAL SERVICE AND OUTPATIENT WORK

Organized Charities.—Charity is no longer merely an impulse of the individual human heart, but, like everything else in this modern day, it has reached an era of organization. There are great possibilities of efficiency in charity, and, without question, it is wiser than it used to be. It has for its basic principle a helpfulness that helps others to help themselves. Charity is an uplifting force in principle; it undertakes to create conditions about its object that will make him self-supporting and independent. While it feeds his stomach in an emergency, it finds him profitable employment so that he may buy his own food. Thus we have to-day great systems of organized charity in the large centers of population divided up into numerous branches, each one assigned to the performance of some special service of a helpful kind.

There are several very definite classes of dependents in every community. The largest of these, of course, is composed of children made public charges by reason of somebody's else fault or misfortune, and the disability of this child class continues until the individual reaches the age at which society expects its members to earn their way.

Unwisdom on the part of society in its attitude of helpfulness toward this dependent child class is the chief agency in the creation of the next most conspicuous class of dependents, composed of the children of this first class after they themselves are grown up and married. Not having been wisely brought to maturity, they finally reach that stage of life wholly incapable of mastering its demands. They marry early, on a small income from menial labor, bring into the world a race of weaklings and degenerates, who eventually find their way into the publicly supported poorhouses, insane asylums, homes for the crippled and mentally deficient, or, worse still, into the prisons and workhouses of the land.

Another class of dependents is composed of adults of both sexes rendered incapable of helping themselves by reason of sickness, either their own or somebody's else.

A fourth class is composed of adults of both sexes who have been improvident during prosperity and whose "rainy day" has found them unprepared.

Let us briefly analyze the details of these classes for the purpose of aiding our judgment as to the origin of helplessness and poverty, and to help form our judgment as to how we shall do our part toward finding a remedy.

We need not dwell on the origin of child helplessness. The reasons are obvious. The fault or misfortune lies beyond the child, in the parent, but we must recognize the needs of the helpless child. It must be housed, clothed, fed during health and sickness; it must be nursed and given medical attention when ill; and when it has arrived at a proper age its education must be attended to, if not because of our unselfish humanitarianism, then in the defense of and for the protection of society in general, which means the moral health of the community and the individual.

Let us pass now to those who have been rendered incapable of making a living because of illness, either their own or others who are dependent on them. In a survey of this class we may assume that the disability is more or less temporary

in character, and, therefore, any aid that may be required is not likely to be continuous. In the event that the illness occasioning the dependency transpires to be of an incurable character, then we have an added problem, not in the direction of helpfulness, but in the length of time for which it will be required; that is, we may have to take care of the sick individual for life.

The next is by far the most perplexing and important class of dependents; that is, those who by improvidence during prosperity have rendered themselves helpless during adversity. This is a most formidable problem for mastery; formidable because the objects of anxiety and interest and intercession are oftentimes unwilling participants in any remedial activities in their behalf. As a rule the members of this class have been the victims of ignorance, intemperance, or idleness.

We take no cognizance just here of another class of our society, not in any way reprehensible or blameful for their condition, that is, former inhabitants of older countries who have been driven from their fatherland by oppression at home, or whose inherent ambition has led them to seek freer and more prosperous and happier lives in a newer and more promising environment. This class of temporary dependents should be placed upon a far different plane than the other classes upon which we have touched, and we shall, later on, elaborate upon means for helping this class of dependents to become independent.

Let us revert now to those who have been made dependent by ignorance, intemperance, or idleness; and by ignorance we mean an absence of that judgment and business acumen that permits most normal citizens to hold their own at least to the extent of a living in the ordinary competition of life. This is neither the time nor place to dilate upon the philosophies of life that endow one individual with the gifts that make for worldly prosperity and that withhold those faculties or inheritances from another individual. If we were to become involved in a discussion upon this line, we should have to invade the whole realm of society, and if we undertook to prescribe a remedy, going back to the origin of this state of things, we should have to recommend a complete revolution in our whole social fabric, at the end of which men and women and babes from their birth must live not in the light of human passions and human frailties, but with mathematic regularity along hard-and-fast lines fixed by laws that an enlightened citizenship would not endorse.

What we are concerned with now is a set of morals and methods by which social dependents may be lifted from their class into the higher levels of society; and in a last analysis this is the very crux of the problem which we indifferently call charity and philanthropy. It is hardly charity and it is certainly not philanthropy, which means love of one's fellowman, to feed a fellow human being just to tide him over from one hour of misery to another. It would be charity to give him a dose of poison to end his sufferings in such a case, or throw him into the sea with a millstone about his neck. What we must do is to feed him first, because that is his immediate need, and then to help him, by reason of our greater strength and better position, to a situation in which he can be enabled to help himself. If poorhouses and almshouses must be maintained, it must be done in the interest of the incurably sick or the helplessly aged. And such institutions as these need give us no worry nor cost an anxious hour. It is the duty of society, which society recognizes, to take care of its derelicts until they have passed beyond need of help.

But the other problem, the one of helping the weak to tide over the bad places in the pathway of life until the going is better or until they are strong enough to go alone, that is, the one that has brought into existence innumerable ideas, methods

without number, and that has diverted millions in money in more or less inefficient and fruitless attempts to find a cure for misery, poverty, and despair.

And so in various parts of the world and from time immemorial countries and communities and individuals have sought by one method or another to create a human machinery for help that shall become self-help, and to-day we are coming nearer to a solution of the great world-wide problems involved in what we have come to call, in this country at least, social service.

The Dispensary.—Almost since the dawn of history there have been masters, and slaves, not called such always perhaps, but in reality such nevertheless, and since these slaves were considered as property and chattels, their health and personal welfare were of interest to the masters. If the slave was sick he could not work, hence the master employed a physician to heal him, not out of any altruistic motive, but for a mercenary end. Later on there were military lords and their retainers, which mustered upon occasion into legions for military service. If a soldier was wounded he could no longer fight, hence a military surgeon and physician was kept with the troops to maintain the fighting men in trim, and at the end of the wars, when the soldiers returned home, the practice was continued; the master provided a physician for his vassals, and the soldiers and their families visited the moated castle for medicines and surgical attention.

The religious orders at an early day took upon themselves the work of ministering to the sick; it was at a time when the priests of all the creeds were the only educated people, and naturally a part of their education involved the healing of disease, sometimes by necromacy and charlatanism, but nevertheless with greater efficiency than could have been done by any other class. These priests were charged by the princes and overlords with the duty of keeping the soldiers and their families in good health. From this beginning grew up the monasteries and the hospices of Europe. After a time there came the inevitable abuses that thrive on privilege, and society took over the care of the sick by the creation of dispensaries. These dispensaries were merely centers to which the sick poor might drag themselves for medicines and ministrations in the way of minor surgery.

In the next stage of the evolution we find the doctor becoming interested in his patient, not yet for love of his fellowman, perhaps, but because of an ambition to excel in his profession, and we find him gravely curious to know whether his patient was taking his medicine and doing at home whatever the prescription called for; and the doctor sent some one there to see. The messenger perhaps reported unsanitary surroundings, lack of comforts, and even the necessities of life, and so the doctor interested himself among his rich friends to see that these necessities and comforts were provided.

Thus, by easy stages, we find the dispensary doctor invading the home of sickness and misery and distress, and attempting in the best way he knew how to extend a helping hand.

Then the poor began to frequent the dispensary, not for themselves, but to report some bad condition of a neighbor or an illness in a neighbor's family, and the doctor's assistants were sent to see what could and should be done. With the dispensary as a nucleus the good that was in the human heart began to shine out into the homes of the poor and sick, and so every ill to which humanity was heir came for its turn of the helping hand, with the doctor always in the forefront, the inspiration and the instrument for doing good and lightening the loads of the burdenbearers of society.

Social Service Broadens Out.—Then came the era of organization. Society was no longer a heterogeneous mass of individuals striving for individual success and

preferment and prosperity, but collective humanity in its own interest banded itself together and became an organization with wheels within wheels, a machine for doing society's work more efficiently than it could be done by individual effort; and this spirit of organization was not long in expressing itself also in the work of charity and in the various fields of philanthropy. Hospitals, orphan asylums, homes for the aged and incurable were organized, and the work became specialized. Small groups of society bent their efforts toward a single purpose, one group taking one special need of the community and another group another need. And so after awhile there came specialization in charity and philanthropy, just as to-day we have specilization in everything, the sciences, arts, and industries. And these various groupings of charity and philanthropy are now organized into what we call social service, or into what the general hospitals call outpatient work.

Let us take, then, one concrete organization for example, with ramifications into every avenue of human need. We have, first, the dispensary, which has become not so much a place from which to dispense medicine, as a bureau of information by which a central organization is made acquainted with the need of the applicant.

Then there is the visiting physician who must go to the home to find out what is most wanted, and the visiting nurse who accompanies or follows him to carry out his orders.

Next we find the emergency relief bureau, whose duty it is to find provisions and fuel, clothing and bedding, and to improve the housing of the destitute family; and thus we have all immediate needs provided for, and then the avenue broadens:

The hospital for whoever may be ill.

The orphanage if the family should be broken up by death, or, in its stead,

The home of the friendless, whose rules will permit the admission of the mother of the family, perhaps, and her small children until permanent arrangements can be made for them.

Perhaps there is a tiny babe whose mother has died in giving it birth. The relief bureau will bury the dead, but there must be a

Home-finding bureau to dispose of and watch over the child. But perhaps it is not illness that the visitors find, but a mother and child who have been abandoned by a worthless father. Again, the relief bureau provides for the emergency and calls in a

Legal aid bureau, which must find the father and compel him to return to his abandoned home and to care for his wife and child.

But perhaps the father's excuse is that he has been unable to find employment, and so purposely refrained from returning home, in the hope that the charitably inclined would have pity upon his wife and child and would give them the care that perhaps would have been withheld were it known there was a father to provide for them. And so we must have an employment bureau.

But it may not have been any of the above ills that have overtaken the family; the father may have been killed or seriously injured while at work or by some public service corporation. Such a helpless family would prove an easy victim for a wealthy corporation or employer, and so this same organization must step to the front through the medium of its legal aid and compel payment, if not sufficient to atone for the loss of the husband and father, at least in a sufficient amount to help take care of the widow and orphan.

Again, the misfortune may be found in the form of an erring girl, who has been overtaken by the misfortune common to her class, and so a rescue bureau for young girls is a real need, where the girl may be cloistered in some quiet retreat up to her

maternity. Then the hospital comes again and the home-finding society, and perhaps the relief bureau for the emergency of her return to her home, and the employment bureau to find her work.

But perhaps it is a sick babe or small child that the visiting doctor and nurse are called to see, and an infant diet is urgently demanded. In these days of milk trusts, and at a time when the so-called pure food laws throughout the land permit the sale of the most vilely adulterated human foods that the mind can conceive, it would be necessary to go far for milk that a sick child can get well upon, and in many communities, thanks to the glorious initiative of Nathan Straus, there are milk commissions and milk depots in nearly all populous communities of this country where the poor can have pure milk at cost or free.

Again, it may be none of these misfortunes that the doctor may find. The home of poverty may be burned down or lost through debt, or the peddler's horse may be dead, or the peddler's pack may be lost. If there were another horse, or another pack, or a little furniture for a new home, the family might rally again, but there is no money; and so generous communities have organized loan associations from which unfortunates may borrow the few dollars they need for temporary tiding over, without interest or, at least, without usury.

And so on *ad infinitum* society has specialized in its charities and in its philanthropies, and the common aim is ever progressing toward a goal at which the needy can get help without encouragement to become objects of permanent charity.

Outpatient Hospital Service.—A great many general hospitals, especially those well endowed, undertake more or less elaborate service to patients not admitted to the institution. This is a species of dispensary service and is organized and conducted to provide for several classes of people who are physically ill, yet not sufficiently incapacitated to be put to bed in the institution. First among these classes we have the convalescent; the busy charity hospital is maintained at so great an expense in this modern day that it cannot afford to keep convalescents until they are strong enough to go to work, and they will continue to need medical care or at least the watchfulness of a nurse at their homes throughout their convalescence, and the hospital can provide this attention and does so in many instances through a visiting nurse bureau, and even if regarded purely from a mercenary standpoint such a service is a paying one, because patients can be sent home much sooner if it is definitely understood by attending physicians that they will be followed to their homes and watched, nursed, and cared for.

Surgical cases are sometimes long drawn out, especially where drains have been necessary, or in cases of tubercular joints or chronic inflammatory affections of the internal organs. If these patients can be returned to the hospital or to the dispensary for dressing, or if they can be visited at their homes by a physician provided for the purpose, or by a visiting nurse, the patients can be sent home far earlier.

If the institution is a maternity hospital or has a lying-in department, outpatient work is of vast importance and will save the institution substantial sums of money and greatly extend its usefulness. It will oftentimes be imperative to admit to the hospital pregnant women who are sick long before their time, women who have heart lesions, for instance, or who have nephritis, either of which may have been vastly exaggerated by their pregnancy, and are liable to meet with serious consequences unless carefully watched. Women with deformities of one sort or another, such as contracted pelvis, are likely to meet with serious trouble unless carefully watched during the whole period of their pregnancy. Women whose pregnancy is complicated with a tumor of some sort are liable to bleed alarmingly and to meet with irretrievable disaster unless they are under the eye of a medical attendant or intelli-

gent nurse. And so with women who have frequently aborted or who are known as "bleeders." For almost any of these cases an actively and intelligently conducted outpatient service will save the hospital the necessity of providing a bed and board for them.

Parole of Children.—In the children's department or in a children's hospital an outpatient service is quite as important. Many sick children, especially those who have been badly nursed or neglected, begin with gastro-intestinal disturbances, pneumonias, typhoid fevers, or rheumatism, and finally develop bad hearts, kidneys, or lungs. Many of these children recover after awhile if they have proper care, but it takes months and sometimes years for them to get well, and they have almost no chance ever to get well unless the parents at home have the guidance of some intelligent person who can direct the feeding and other care of the child. No institution can afford to keep these children through all the necessary months or years, nor is it desirable to do so. An outpatient service could do this work admirably, especially if there is a reasonable fund available out of which to provide good milk and eggs, and some of the commoner yet wholesome articles of child diet. Oftentimes these children can be returned to the hospital frequently, and in some institutions there is a parole system in practice. In the working out of this system the parents of the child are given a return card which provides that the child shall be returned to the hospital for examination on stated days, according to the necessities of the case. The wording of this card is of some moment, and, therefore, it is reproduced here:

MICHAEL REESE HOSPITAL

CHILD'S RETURN CARD

NAME OF CHILD.....ADMISSION NO.....

DATE OF ADMISSION.....DATE OF DISCHARGE.....

DIAGNOSIS.....NAME OF PHYSICIAN.....

Parents Read This. You are expected to bring.....to the Michael Reese Hospital every Saturday morning at 9 o'clock to have her examined by Doctor.....

SIGNED.....SUPT.

A similar card, worded a little differently, is employed in the maternity department, and in the working out of the system the mother is obligated to return to the hospital at stated intervals to be examined, and both she and her infant are thus watched and guided beyond the critical stages of nursing and infancy. The mothers of both these classes of children seem to take great interest in this privilege, and are grateful for the constant watchfulness of the institution over their little ones, and it transpires that there are few women who fail or refuse to return their children at the times indicated.

This parole system is an excellent procedure also in institutions that are affiliated with or a part of medical schools, because the parole cards can be made to call for the return of certain classes of children on clinic days, and thus, for instance, a great number of heart cases or kidney cases can be assembled when the class is studying those particular diseases of childhood.

Another class of patients that is worthy of a systematic outpatient service is those suffering from chronic disorders, as, for instance, tuberculosis, either pulmonary or of some other part of the body. These patients are not good hospital cases

and are usually not admissable in the wards of general hospitals, and until society is better organized to care for tuberculous patients in special institutions an outpatient service is the next best thing. It is not profitable to the patient to have him returned to the hospital for frequent examinations, and a visiting physician or an intelligent visiting nurse in the home will give a better service. Usually the great trouble with tuberculous patients is that they are so optimistic that they refuse to realize the gravity of their condition, and they go back to their homes and live just as though they were well. They fail to care for themselves properly, ignore the necessities of diet and fresh air; and they constantly expose other members of their families to infection because they refuse to believe they are dangerous. The visiting physician or nurse will not fail to observe existing conditions in the home, and in most cases can have an immensely important effect in regulating the lives and habits of these patients and in protecting other members of the family.

There is another outpatient service that is perhaps quite as important as any of the foregoing, and that especially concerns those institutions whose problem involves the care of a definite class in the community, as, for instance, the sick poor of a settlement of foreigners. These people often are huddled together like burrowing animals, in ill-ventilated, poorly lighted, unsanitary hovels, garrets, or basements. If one of their number falls sick, the others will crowd about him, withholding from him nature's aids to health, to say nothing of their neglect or inability to provide for him a doctor. A physician provided by the community or a visiting nurse with her trained mind, hand, and eye may mean health to the sufferer and vastly improved conditions to the balance of the family. Oftentimes sick people under these conditions apply for admission to the hospital through their friends or relatives.

The patient is sick at home, and an ambulance will be needed for conveyance to the hospital. Oftentimes it is an incurable disease from which the patient suffers, one not desirable in the general hospital, or the patient may be merely afflicted with old age, another undesirable disease for the wards of a general hospital; or it may be a communicable disease of some sort that should go to some particular institution organized for the care of just such cases. In other words, there are great numbers of sick people at home in bed who apply for admission to the general hospital who do not belong there, and if there can be a visiting physician or even an intelligent nurse to visit the home and see the patient, it will save the patient great distress and suffering in transportation, and frequently will save the hospital from the burden of a patient that does not belong there, as well as the service of the ambulance or other means of transportation.

BUSINESS MANAGEMENT

THE OFFICE

THE business office of a general hospital and of, indeed, any institution intended for the care of the sick or dependent is a clearing-house for the transaction of all of the business appertaining to the admission, care, and discharge of the patient. So that, in contemplation of the business office of an institution, we may as well begin at the actual beginning—the admission of the patient to the institution.

It makes no difference whether the patient is brought to the institution by the city authorities, or the police, or in an ambulance from his own home, or walks in, or is driven up in his own automobile. The technic of his admission is practically the same, with a few unimportant differences.

Let us consider, first, the pay patient, as we are pleased to call the man or woman or child who proposes to pay his or her way in the institution. Such a patient usually is sent by some physician who has the right to treat patients in the hospital. A question frequently asked in this connection is whether a private patient sent in by a physician should be subjected to a physical examination at the hands of the hospital admission department. The answer would seem to be both Yes and No. If the physician is a member of the staff, and is wholly responsible for his actions and can be relied on, and is a man who knows definitely the policy of the institution as to the character of patients which it is willing to receive, it would seem humiliating and unnecessary to subject his private patient to examination at the hands of some young, inexperienced medical man, the implication being that the hospital is in doubt as to the admissibility of the patient, and, hence, of the honesty of purpose of the physician who has sent him in; and attending physicians, under such circumstances, will and have a right to resent an admission examination of their patient.

But there is also the other side of the question. The physician may be a high-class man, one held in the highest esteem in the community, but he may not be directly connected with the institution, and he may not know, for instance, that the hospital does not take infectious diseases or incurable diseases, and it would seem that under such circumstances it would be entirely proper for the hospital to exercise at least that amount of surveillance necesary to protect itself against the admission of an undesirable patient for whatever reason, and it would hardly seem that an outside physician, under such circumstances, could legitimately complain of the exercise of such discretion.

In any event, the examination of a private patient in the admission rooms of the hospital should never go beyond the point of determining whether the patient is one that the hospital can properly accept.

Now let us carry these pay patients a step farther into the institution, because the technic of their reception is just a little different in one other detail from that of the free patient. Let us agree that this pay patient is acceptable to the institution and that there is a room or bed available, and that the admission cards, which we shall presently consider, have been properly made out, and the patient ready to be taken upstairs. It is of almost daily occurrence in most institutions

that patients complain about unexpected charges in their bills. It is not that they are surprised at the price of the room, perhaps, or certain of the extras that seem reasonable to them, but it so frequently happens that there has been some item of expense included of which the patient or his friends were not aware and did not expect, that the whole incident is an unpleasant one and, it would seem, quite unnecessary. We are not to discuss hospital charges at this point, but only the hospital bill, and that briefly.

If there must be extra charges in addition to that for the room or bed, the patient, it would seem, has a right to know what those charges are. In the hotels there is a room card attached to the inside of all room doors on which is printed whatever information it is necessary for the guest to have. This cannot very well be done in a hospital, because in many of the rooms there is more than one patient, and perhaps there are different charges under varying circumstances, and hospital patients are not all on the same footing, nor can they be. So it would seem, therefore, that the announcement of the conditions under which the patient is in the institution ought to be an individual affair, and that each patient ought to be given the necessary information as he enters the hospital. In some institutions there is an admirable practice of keeping a card with blank spaces to be filled in, and this card is filled in for each patient who is admitted, and is taken upstairs to the patient's room and handed either to the patient himself, if his physical condition warrants, or to the responsible member of his family who accompanies him to the institution. This card is a matter of a good deal of interest, and it serves its purpose so well where it is employed that it is reproduced below:

MICHAEL REESE HOSPITAL

RULES FOR PRIVATE ROOM PATIENTS

The price of room.....is.....dollars per week, payable weekly. Patients remaining less than one week will pay an additional 20 per cent. for fraction of a week.

Private patients are entitled to board, medicine, and usual nursing without additional charge, but an additional charge will be made in all surgical cases, amounting to.....dollars, to cover part of the cost of the use of the operating-room, also the actual cost of gas (when used) at the rate of $2.00 for each fifteen minutes of an operation. An additional charge will be made for rare and expensive drugs, if specially obtained for an individual case; champagnes, wines, and mineral waters will also be charged for.

x-Ray pictures and treatment are extra, the former for head or trunk $10.00, arm, leg or teeth $5.00; for treatment according to the service rendered.

Antitoxins, serums, and vaccines $5.00 and upward, according to the service.

Special house nurses will be furnished at $15.00 per week. Graduate nurses charge $25.00 per week for their services, and the Hospital charges $5.00 per week for their board.

Patients are requested not to bring valuables to the Hospital, as the Hospital will not be responsible for the same, unless turned in at the office and a receipt given therefor.

The Hospital furnishes meals to visiting friends in the guests' dining room, when desired, at a charge of 50 cents for breakfast, $1.00 for dinner and $1.00 for supper.

Patients may be visited (subject to the orders of the attending physician or surgeon) from 9 A. M. to 8 P. M., but not more than two visitors will be allowed to remain in a patient's room at one time.

Signed.....Superintendent.

ADMISSION OF THE FREE PATIENT

Every free patient that comes to the hospital applying for admission should pass through the examining room, no matter by whom sent or under what circumstances. If he has been sent from a dispensary other than that of the institution itself, it is reasonably certain that not a great deal of care or consideration has been taken to guard the interests of the hospital; and experience has taught us that

the average doctor, whether a private practitioner or employed in a dispensary, is too apt to give a card for a patient's entry to a hospital, either to get rid of the patient or out of pure "good-heartedness," or, as it has been sometimes stated, "out of charity"—that somebody else pays for.

If the patient is sent in by a member of the staff, a busy man perhaps, with a large private practice and little time at his disposal for the examination and consideration of free patients elsewhere than in the hospital, it will be fairly certain that he has been actuated by one of two considerations: either the patient is a protégé or perhaps a servant of some responsible person whom he is pleased to favor, or he has been actuated by a feeling that on general principles the patient will be better off in the hospital where he can get good attention and be cleaned up for a better examination. In either event it would seem best to pass the patient through the examining rooms for the purpose at least of a sufficiently definite diagnosis to determine the service in the hospital to which he should be assigned.

As soon as the applicant is inside the doors of the institution and his wants ascertained he should be handed a card which calls for an examination at the hands of the admission physician. A very serviceable form of such card follows:

NAME

ADDRESS

SENT BY

DISEASE

ADMIT TO SERVICE

REASON REFUSED

EXAMINED BY DR. DATE

If there is a large admission service, interns or examining house physicians are very often careless about filling out this card, but it should be insisted upon, and especially in the case of applicants who are refused admission, because it very frequently happens that influential persons are interested in applicants for free care in a hospital, and it quite as frequently happens that applicants refused admission because of the apparent slightness of their illness develop soon after a serious condition, and the institution is more than likely to be called on by some one who has a right to ask for a reason why the applicant was rejected; therefore this examination card should state specifically and in as great detail as possible just what was found and why the patient was rejected. These cards should be kept in two file cases, one for patients actually admitted, to be kept in the main office of the hospital; and the other, the "rejected" cards, may be kept in a file alphabetically arranged in some private drawer, under lock and key, in the admission room, where they can be consulted at any time by those in charge.

DETAILS OF THE ADMISSION

As soon as a patient presents himself in the business office of the institution for admission, either with a card from the examining room or as the private patient of a physician, and it is agreed that he shall be accepted, the admission cards are made out. There are two of these cards, differing only in size and in the further particular that the large one contains whatever financial arrangement exists between the patient and the hospital, while all reference to finance is omitted from the small card. The large card is printed below, and it would seem that this card would meet with all the requirements of most general hospitals, purely as a card of admission and for no other purpose:

Name		Date		Ward or Room	Admission No.
Address		Telephone		Service	Transferred to (Date and Place)
Attending Physician		Examined by Dr.		Admitting Diagnosis	
Age	Sex	Occupation	Nativity	Married Single Widower Widow	Religion
Name and Address of Nearest Relative or Friend				Tel. No. Relative or Friend	
Rate per Week		To be Paid by			Address
Financial Arrangements					
Discharged (Date)		Final Diagnosis		Condition:	

This card is retained in the business office and is laid aside for the day after it has been filled out and until the night clerks have had an opportunity to enter it upon the books in such manner as we shall hereafter prescribe, and when this routine has been gone through with it is filed alphabetically in a card index case kept for the purpose, and it remains there until the patient is discharged, whereupon it is withdrawn from that card case, filled in properly, and filed alphabetically in another case of the same sort for "discharged patients." It will be convenient to keep these discharged patients' cards where they can be easily reached at least for a month or two, because questions often come up about recently discharged patients and it will be necessary to refer to the card; afterward this card can be put away with the archives of the institution or entirely disposed of, because the record of the patient for all purposes has taken on a permanent character along other avenues.

The small admission card, containing the same serial number as the other, is intended to accompany the patient upstairs, and is handed over to the head nurse as the order of admission, and is the beginning of the permanent record of the patient, to be finally filled out and returned to the business office with the balance

of the record when the patient is discharged, for such disposition in the library of the institution as we shall hereafter describe.

The Room Board.—Before the receiving clerk can know where a patient may be assigned, or what accommodations of the hospital are vacant, he must have access to some definitely carried out scheme of room board. Figure 169 is a room board which seems, in an experience of several years, to have met every requirement. The illustration explains the mechanism in detail. The board is divided into floors, and the rooms on these floors are given either their proper number, if they be private rooms, or the official designation if they be wards. For the private rooms there is a card space for a single name, and these little cards that fit conveniently into the space carry the name of the patient, the name of the physician, the date of admission, and any other memorandum that may seem necessary. Under

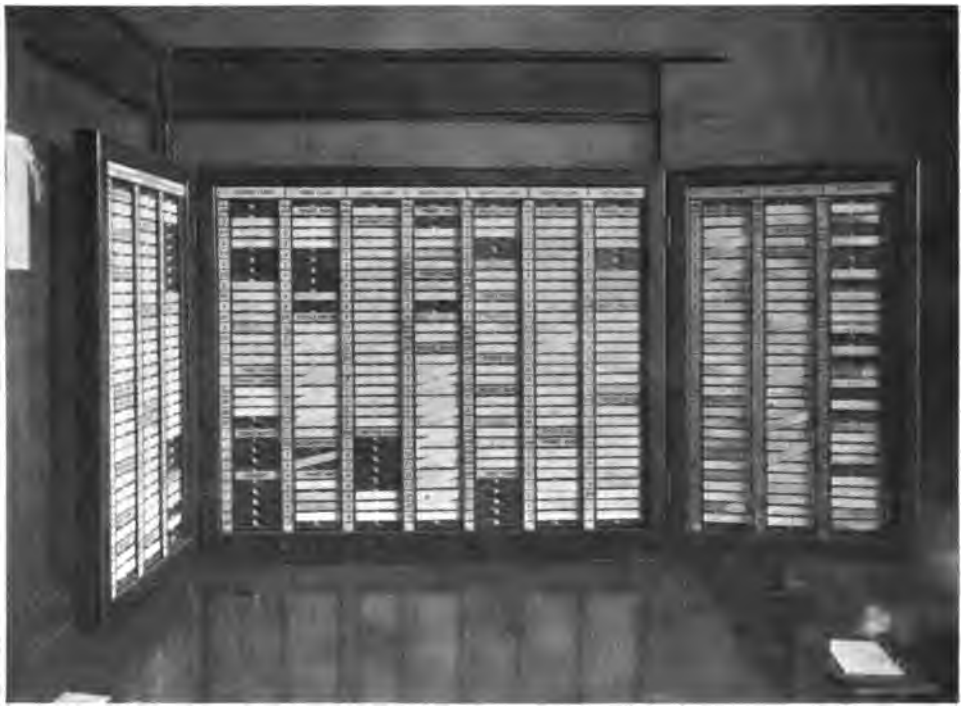


Fig. 169.—Room board.

the small ward numbers there are spaces for the number of beds in the room, and these spaces when occupied are filled out with a card bearing the same information as in the case of private rooms, and the large free wards, if there are such, are carried in the same way. In the working out of the scheme there is a space properly designated on the board for every bed in the house.

Two or three colors in the cards are advantageous in this board. White cards indicate the bed or room actually occupied by a patient. A red card may be used in a space when the room or bed is engaged, but before the arrival of the patient. A blue card may show a space in the room or ward for a bed, but indicates that there is no bed there. A card of another color may be used to indicate the fact that the room is not in order to be occupied; it may be undergoing repairs or it may be used at the present time for some other purpose than the housing of patients.

In the making up of this board thought ought to be taken for the future, and it should be constructed on large enough lines to meet every requirement of the future. For instance, a room may be occupied at the present time by one patient, and it may be used as a private room, but looking ahead a long way it may be conceivable that it might one day be used for two beds, or more, and in such a case there ought to be space on the board opposite the number of that room for all the beds that can at any time be placed in it for use, and so with the wards; a ward may have only four beds, and the beds may be charged for at a certain price this year, but in four years from now arrangements may have been vastly changed, and this ward may be used for six or eight patients, and the board ought to show that the size of the room would, if necessary, allow that many beds; the extra space in a ward or room can be indicated by a blue card or by leaving the space vacant. This mechanism was built especially for hospital purposes, and it answers all of those purposes far better than any hotel board commonly on the market.

It is well, in making this room board, to make it in parts, as shown in the illustration. There is a middle part half the size of the board which screws to the wall, and two other parts that form the doors to the board, and the inside of these doors when opened out make up the aggregate of the board. The purpose in making the board so that it can be closed up is a twofold one: first to keep the dirt out, but last, and very much more important, to keep prying eyes away. Many patients are very much disposed to keep their presence in the hospital private, and oftentimes it is the express desire of the physician that it shall not be known that the patient is in the house. It may be a very prominent man, or a society woman, or the nature of the disease may oftentimes be such that the patient desires that his or her presence shall not be known, and there are a good many visitors in the hospital who might have access to such a board as this, and who oftentimes are not quite discreet, and they should not be tempted by having the board wide open so that anyone may see the names there.

Disposition of Patients' Clothing and Valuables.—Conveniences in the shape of closets in the private rooms and, perhaps, metallic lockers in the small private wards are, of course, provided in most hospitals, and either the head nurse or the patient, if practicable, will become the custodian of the keys to these closets; so that the patient's clothing will not be subject to removal by other persons. The card that has accompanied the private patient upstairs states specifically that the institution will be responsible for money and jewelry and valuables belonging to patients only in the event that these are turned over to the office and a receipt taken therefor. This receipt may be kept either by the patient, if practicable, or by the head nurse on the floor, if she has conveniences for keeping securely such papers.

Sometimes the friends of patients choose to take home whatever valuables there are, and it would seem that this is a good practice, especially if the patient is quite ill and helpless; but it very often happens that the friend, so solicitous of the chattels of the patient, forgets to account for some item and undertakes to hold the institution responsible for its loss. It would seem, therefore, an extremely safe practice for the institution to insist upon a detailed inventory of all personal property removed by a friend of the patient, and a receipt therefor from the person removing the same. Such a receipt will save embarrassing inquiry often enough in the course of a year to repay the trouble necessitated in making the inventory and in obtaining the receipt.

We come now to the belongings of the free patients. In some institutions, especially in children's hospitals, the parent, friend, or relative who brought the

patient to the hospital is compelled to take the clothing back home, and the hospital makes no provision for keeping the clothing of patients. It may be well doubted whether this is a very good practice, especially in the case of children. It is oftentimes very difficult to persuade children's parents to take their children home after their recovery. Perhaps a child has been ill for a long time, and the parents naturally agree that since it got well in the hospital it will be better off there for a while longer, and many excuses are made by parents for refusing to take their children home, not the least of which is that they have not clothes in which to clothe them, and in order to get rid of the children the institution is frequently compelled to buy new clothing, which may or may not be part of the purpose of the parents in making the complaint of their poverty.

Where provision is made in the institution for the care of patients' clothing, it ought to be a part of the routine of the admission of the patient for the nurse or orderly who gives the bath to make out a complete and detailed clothes list, and if possible this list ought to be signed and approved by the patient himself or by some responsible person acting for him, because nurses and orderlies have been known to be careless in the gathering up of patients' clothing, and articles are sometimes missed from the bundle.

This bundle of clothing, either at once or in common with other like bundles at the close of the day, should be sent to the storekeeper or other person who has charge of patients' lockers, and that person, in the presence of the orderly or nurse who delivers the clothing, ought to be compelled to open the bundle, count and check the articles and tie it up again, and he should then receipt for the bundle, and this receipt, which is written upon the inventoried clothes list, should be returned to the head nurse, who will keep it under lock and key until the patient is ordered discharged. The next step in this procedure at the time of discharge should be for the head nurse, or one of her floor nurses, or an orderly assigned for the purpose to take this list to the business office, where it should be stamped with the approval of the office before the clothes can be delivered by the custodian. This procedure will be sufficient announcement to the main office that the patient is about to go home, so that any financial or other business may be transacted with him before he leaves the institution.

HOSPITAL VISITORS

Conditions vary so greatly in different institutions that it is, of course, impossible to lay down hard-and-fast rules for visitors, and even the several parts of a general hospital cannot be regulated in that respect in the same way. Visiting rules that would be entirely proper for surgical patients would not do at all in the children's department or in the maternity section, and the best we can do is to discuss a few general principles.

We may begin with the flat argument that it would be best for all sick people if all visiting could be prohibited, and it is a recognized situation in nearly every hospital that has visiting days that temperatures are higher at night on the visiting days than at other times, all else being equal, and this is due to the excitement caused by visitors, not alone one's own visitors, but those who come to see other people.

Visitors in the hospital very frequently feel that they have fulfilled only half of their mission if they do not go about the wards of the institution talking with and offering sympathy to patients at large, and especially if there is some particularly sick person near the one they have come to visit; the visitors seem to focus

their attention upon that one, and instead of helping they almost invariably retard the patient's recovery, and oftentimes excite him to a serious extent.

In considering the visiting question, therefore, we have two or three fundamental ideas in the foreground; one of them is that we ought to restrict visiting as much as possible; and we ought, in any event, to limit visits to the one patient whom visitors come to see; and visits should be as short as possible, and wherever it can be done each patient should be restricted to one or two or at least a minimum number of visitors. It very often happens, where the visiting hours last during the whole afternoon, that a patient will have a continuous stream of visitors, only one or two or three at a time perhaps, and when new friends come those who have been there a while get up and leave. And very often visitors are indignant if the hospital presumes to judge how many visitors a patient should have.

Oftentimes the doctor is of no assistance in restricting the number of visitors. When he is at the hospital, he is likely to give peremptory orders restricting visitors to two or three members of the family, or even one, and when the doctor's orders are cited to visitors later on in the day they will bring such pressure upon him that he is compelled to raise the restriction, and then find fault with the hospital authorities for his having been compelled to do so.

In some institutions it is possible to have only one or two visiting days a week and one or two hours on each day, and to limit the number of visitors to one or two people. Such conditions as these are ideal, but they are almost impossible in most institutions, and invariably so in institutions that have a clientele largely made up of pay patients.

Let us now consider the question of visitors in the several parts of the hospital rather more in detail.

Visitors to Private Patients.—It would seem that the hospital has a right to throw the whole matter of visitors upon the shoulders of attending physicians in the case of private patients, and if it can do this the institution escapes a large measure of responsibility and an immense amount of trouble, because, after all, the question of visitors is a part of the treatment of the case, and the doctor should be the final judge as to what is best for his patients, and he is presumed to have courage enough to give the proper orders.

Visitors in private rooms present a problem even easier of solution than in the private wards, because in the one case visitors do not interfere with anyone else; they go into the patient's room and remain there until they are ready to leave the institution; so that the question of hours and the number of people that ought to be admitted to private rooms is one entirely within the realm of the doctor's orders.

In the private wards, however, there is presented the additional difficulty of interference by visitors with the rights of other patients than the one they came to visit, and there is presented a responsibility that the institution itself cannot escape, and the orders of a physician attending one patient should not be permitted to invade the rights and interfere with the welfare of any other patient in the ward. In the private rooms, therefore, we may consider it almost an established necessity to allow patients to receive visitors, subject to the doctor's orders, at almost any time of the twenty-four hours, and concerning the private wards there is an established practice in a good many institutions that are well conducted to restrict the visiting hours to the afternoon only, say from 1 to 5 o'clock, as being a fair restriction in the interest of all the patients in the ward.

Visitors in Large Wards.—The real problem concerning visitors presents itself in connection with the large wards, whether the patients are free or pay a small amount in the hospital. It goes without saying that indiscriminate and continu-

ous visiting in the large wards cannot be permitted, because visitors create a certain amount of disturbance and excitement, and if one patient is allowed to see visitors, others must be allowed the same privilege, and if that principle is carried out there will be a stream of visitors all day and into the night.

Where the institution receives a large proportion of free patients and gets nothing from these patients or from anybody specially interested in them, but gives everything to them without any return, rather fast rules can be set down tempered only by humanitarianism, that is, the human right of sick people to see their friends whether they be rich or poor; and in such institutions the visiting hours can be cut to perhaps two hours twice a week, without any right of complaint either on the part of the public or the sick people, and such restrictions will go a long way toward aiding the patient's recovery.

There are a good many institutions that have some definite problem of work as the inspiration behind their support, some particular class of poor people in whom the supporters of the hospital are specially and humanly interested, and unless the visiting hours in such institutions are generous there will be so much complaint that the support of the hospital is likely to suffer, and it may be necessary in such cases to open the doors to visitors in the large wards for two or three hours each day in the week.

Where a patient in a large ward is so ill that the excitement of visitors about the other beds will be a positive detriment, a screen may be thrown about the bed, and if visitors are kept under proper discipline the excitement and hurtfulness of the visiting hours will be minimized greatly; sometimes it will be necessary to place an exceptionally sick patient in the quiet room or in some isolated place during the visiting hours, and this will be particularly true in the children's ward.

Visitors in Maternity.—No matter what the institution or how it is conducted or whence its support is derived, there is a definite duty on the part of the hospital administration to ruthlessly limit the visitors in the maternity department of the institution. It is true the mothers and babes are not sick people, and after the first two or three days following the birth of the child the mothers evince a good deal of curiosity about the outside world, and they like to have visitors, and oftentimes fret and complain if they are not permitted to do so, but visitors are actually hurtful to women in childbed, and their presence often starts a temperature that is apt to find a focus somewhere and be the beginning of an infection that may be serious.

There is an immense amount of curiosity on the part of the public concerning the maternity department of a hospital, and this is especially true with women, who will oftentimes gain access to the maternity department under the flimsiest excuses, merely to gratify an idle curiosity regarding the women and their babies. In other parts of the hospital it is not well for patients to have too many visitors or to have them too often. In the maternity department, however, there is an absolute necessity to limit the visiting, and in a number of excellently conducted maternity institutions the visiting in that department is restricted with an iron hand to the husband of the patient and, perhaps, her parents. As in other parts of the hospital, this rule applied to private rooms and even the private wards cannot be drawn quite so finely as in the case of the large maternity wards, and the visiting hours in those private sections will oftentimes have to be lengthened.

There is no doubt that a woman in childbirth is improved, at least mentally, by having her husband and perhaps her parents visit her as frequently as possible, especially after the first two or three days, and if she is occupying a private room or a small ward no great harm can follow.

But in the large wards the rule will have to be mandatory. It would seem that a husband and father ought to be permitted to see his wife and child as soon as she is comfortably in bed, and he ought to be permitted to visit with her for a while and it will be a great comfort to the patient. But after that first visit there is no particular reason why the husband should come oftener than two or three times more during the patient's stay in the institution. So if the visiting can be limited to, say, two hours twice a week, that would seem to be abundant. Whenever a woman has a baby in a hospital, her kin and all her friends want to see her, and especially they want to see the new baby, and if permitted they will keep the patient in an excitement that is positively harmful, and that will very many times result in some complication of childbirth.

The most difficult thing to control concerning visitors in a maternity department has to do with the visits of children. As soon as a babe is born to a woman who has other children at home, she wants the other children to see the newcomer, and she will generally raise a row if it is not permitted; but it ought not to be permitted for children to visit in the maternity department of the hospital under any circumstances, and unless an ironclad, inflexible, and irrevocable rule is established prohibiting children from visiting the section the whole rule is lost. If an exception is made in favor of a rich banker's wife and she is permitted to have her children in her private roon, then the private patient of moderate means will exact the same privilege and will be highly incensed if the rule is drawn against her; and if she, too, is allowed to see her other children, then the patients in the private wards will exact the same privilege, and so on to the large public wards, so that it would seem imperative to prohibit the visits of children anywhere in the department.

Why? Because children from the outside oftentimes have some communicable disease of childhood incubating in their systems, and the little new babies are veritable sponges for absorbing anything in the nature of an infection. If the department has any considerable service, that is, if there are many cases of labor, and hence, if many children are to be permitted to visit in the department, it is a moral certainty that about so often some child will light up a communicable infection such as measles, scarlet fever, or even diphtheria, and not only jeopardize the lives and health of the new babies and their mothers, but bring the department into disrepute and destroy its power for usefulness.

It is the experience of some of us that the doctors will fight this rule against child visitors, and manifestly they will do it to curry favor with their patients, but it is also the experience of some of us that if the rule is made inflexible and unexceptionable the physicians who frequent the department will eventually have a respect for it, and they will feel all the safer in bringing their patients there, and they will oftentimes use that very rule as one of the principal arguments with a patient why she should go to that particular hospital for her maternity, rather than to some other institution whose rules are a little more lax and flexible.

Every non-medical visitor in the obstetric department of an institution ought to be compelled to wear a hospital visitor's gown, preferably one of the flour-sack kind that has no sleeves, and that is put on like a woman's skirt over the head, with a hole just large enough for the head to slip through, and that will reach almost to the floor (Fig. 170). In this way visitors are not permitted to use their hands, which are kept under the gown, and they cannot meddle with things that do not concern them, either in connection with their own mother and babe or in connection with the ward service, instruments, and apparatus. Visitors object to these gowns at first, and their use must be quite as inflexible a rule as that concerning the visits

of children, but after a while, when the rule is well established, visitors appreciate the necessity for it.

In the Michael Reese Hospital Maternity Department 93 babies were born during the fiscal year of 1906 and 1907. At the end of that year a new régime was established and the inviolable rules above cited were inaugurated, and it was freely predicted that the department would be destroyed. Instead of that, however, the service there now averages more than 90 labor cases per month, or twelve times what it was five years ago, and nearly half of these 1000 patients per year are women who can afford to pay for a private room from $25 per week up to $100.

Fig. 170.—Visitor's gown.

Thus is presented a plain argument that a rigid conduct of a maternity department that stands for asepsis, cleanliness, and healthfulness is appreciated by the public in the long run.

Visitors in the Children's Hospital.—It would seem at a first glance that the visiting of parents to children in the hospital would aid their recovery, but this is not true, and sick children do far better when their parents keep away. Whatever may be said about parental kindness, it is at least true that parents who send their children to the hospital are not the best possible influence that can be brought to bear on them when they are sick. Perhaps the reason why a good many of them are sent to the hospital rather than kept at home is because the parents, for one reason or another, have not nursed them wisely and have not been best calculated to aid in their recovery. In any event, experience has demonstrated that a vast majority of parents who visit their sick children in the hospital bring something in their pockets which they surreptitiously give them to eat that is not good for them; in addition to this, parents nearly always resent any hospital practice that seems to render the child uncomfortable, and these visitors give the nurses a great deal of trouble. They have been known to take the children out of hot-packs, prevent the giving of enemas, and frequently interfere even with the taking of temperatures. If they are in the hospital during the feeding hours, it is a common complaint that the children are being starved or that they are not accustomed to the kind of food they are getting.

Parents, generally, will refuse to leave their children at a hospital if they cannot visit them frequently, and one reason that they give is that the children make themselves sick crying if they, the parents, are not there, and there is apparently a good reason for their feeling in this regard. When the parents visit the hospital, generally speaking, they will find the child in a good humor if it is not too sick, and the child will enjoy the visit with the parent, but when the parent leaves

the room to go home the child begins to wail, and the parent will hear the child crying sometimes until she is clear away from the building, and she is, therefore, under the impression that the child will continue to cry until she returns. Oftentimes these children do cry for an hour after their mothers leave them, and then they will not cry again or even ask for the parents until they come again, when the performance is repeated.

Visitors of a certain kind ought to be made welcome in the children's department; not the mothers of children, because they create a certain ferment there and interfere with rather than better the condition of the children. But in some institutions there are certain young ladies' societies whose members take turns and are assigned alternately to visit the hospital and entertain the children. If there are playrooms, and books and toys and pictures, the children get an immense lot out of the visits of these young ladies, and it is very certain that the young ladies get a lot out of their work at the hospital; it is a question which benefits the most by the entertainment. In any event, if there are regular hours for the visits of these young ladies during which the children can be entertained, they will come to look forward to those visiting hours with an immense amount of pleasure, and if there is a roof-garden or some out-of-door place where the little entertainments can be held the children will get recreation, fresh air, and great benefit.

It would seem that after a while the young ladies would get tired of their self-imposed task as nursery maids and children's entertainers, but that appears not to be the case. In one or two institutions in which this practice prevails that can be cited as illustrations young ladies' societies, that could be hardly held together when sewing and other charity work was the inspiration, have grown so amazingly when the hospital work was inaugurated that a limit had to be set to the membership.

Social Visits of Physicians.—Nearly every institution is presented occasionally with the ethical problem set up by the social visits of physicians to the patients of other physicians. It may seem that this is an insignificant matter, but experience has demonstrated that it is not either simple or inconsequential. We all know that there are doctors in every walk of life almost who make a practice of securing patients through social, political, and religious influence, and these gentry frequently ply their trade within the walls of the hospital.

Mrs. Jones is sick and the ladies of her church circles are intensely interested in her welfare, and they discuss her case perhaps in the persence of the minister's wife, who happens to be an intimate friend of a neighboring doctor or his wife. There is another physician treating Mrs. Jones, perhaps a most competent man. Mr. Jones is anxious and uneasy and expresses his concern to the minister or the minister's wife, and perhaps names over a lot of symptoms from which Mrs. Jones seems to be suffering; whereupon the good minister and his wife proceed to dilate upon the great ability of their friend and neighbor doctor, and perhaps they are enabled to cite a long list of cases apparently very similar that that worthy medical man has cured; and it is finally suggested that he be asked to pay Mrs. Jones "just a social visit." The next step is for the visitor to find fault with the line of treatment employed in the case of Mrs. Jones, and eventually he succeeds in agitating the whole circle of friends, if, indeed, he does not actually succeed in replacing the attendant physician in the case.

This is but a fair illustration of what is practised daily in connection with almost every hospital. The question is how to meet such a contingency; of course, the institution would not allow an outside physician to come in and review the orders of the attending physician, but it is not a difficult thing for a medical visi-

tor on a social call to get hold of the record and post himself as to what is being done, at least sufficiently to find fault with it after he gets home.

It seems that the only way to master this problem is to ask medical visitors to patients not their own to place themselves first in touch with the attending physician in the case, and it can be fairly pointed out that that will be the method most pleasing to the ethics of the case; and in the event that a medical man should object to express his wish to visit a patient to the attending physician in the case, it would seem that such a man could be refused admission to the patient without very much ceremony. And when a medical man is finally permitted to pay a social visit to a patient he ought to be accompanied by the house physician on the case, this for the protection of everybody concerned.

Of course, no self-respecting physician will consent to visit professionally the patient of another physician until all the ethical requirements have been complied with; that is to say, a patient or the responsible member of his family has a perfect right to ask the attending physician for consultation at any time, and if the proposed consultant is unexceptionable, the attendant must agree to it, and himself ask the consultant to meet him in the case. Or a patient has a perfect right at any time to dismiss a physician and employ some one else, and the only thing to be done is for the patient or some one representing him to tell the attendant he is no longer wanted, pay him off, and secure the services of some one else, and the new attendant will be perfectly satisfied when this course is followed.

A Device for Handling Visitors.—Naturally, visitors to private-room patients may use a visiting card of their own, which is sent to the room of the patient in advance, so that the prospective visitor may learn whether the visit will be agreeable or not, but in the wards of the institution it has always been an extremely difficult matter to maintain a check on the number of visitors to each patient. In the Michael Reese Hospital a board has been devised, photographs of which are shown herewith (Figs. 171, 172).

This board is set up at the desk in the main hall, where visitors must receive their credentials before going into the hospital proper. On this board are figures representing all the wards of the institution, and beneath the number of the ward are small pockets made of vulcanized rubber or some such material, the number of pockets for each ward corresponding to the number of beds in the ward, and in each of these pockets are three cards; one projects above the other two and contains merely the name of the patient occupying the bed. In front of this name card and a little shorter, so that they do not hide the name, are two other cards, the regular visitor's cards of the institution, and these cards also contain the name of the patient written lightly in lead pencil so that it can be easily erased for use of the card elsewhere. It is the practice to allow two visitors only at one time, and when the two cards apportioned to the patient have been distributed to visitors no other visitor can see that patient until the cards are again returned to the board, as evidence that the visitors have gone. If it is ordered that the patient shall have only two visitors during the day, the cards will not be returned to the rack until night. If the patient can have as many visitors as choose to call the cards are immediately returned to the rack on their surrender by visitors as they leave, and they can then be given out to other visitors. Sometimes the patient is not to have any visitors at all, by the doctor's orders, and in such case a note to that effect is stuck in the pocket against the patient's name, so that visitors may be refused when they present themselves. Sometimes it is necessary for the business office to see the friends of the patient for financial or other reasons, and in that case a note to that effect is slipped into the pocket against the patient's name, so that

any one who calls to see the patient can be sent to the office; or perhaps it is the house physician who wishes to see the friends of a patient to present some problem or make some announcement, and the note in the pocket will request that the house physician be sent for when a visitor comes.

Before this visitor's board was installed visitor's cards were collected by the elevator operator as visitors went upstairs. Naturally, this practice could not be continued after its adoption, since the visitors themselves were required to return the card to the rack, and upon each visiting card there is a printed statement to the

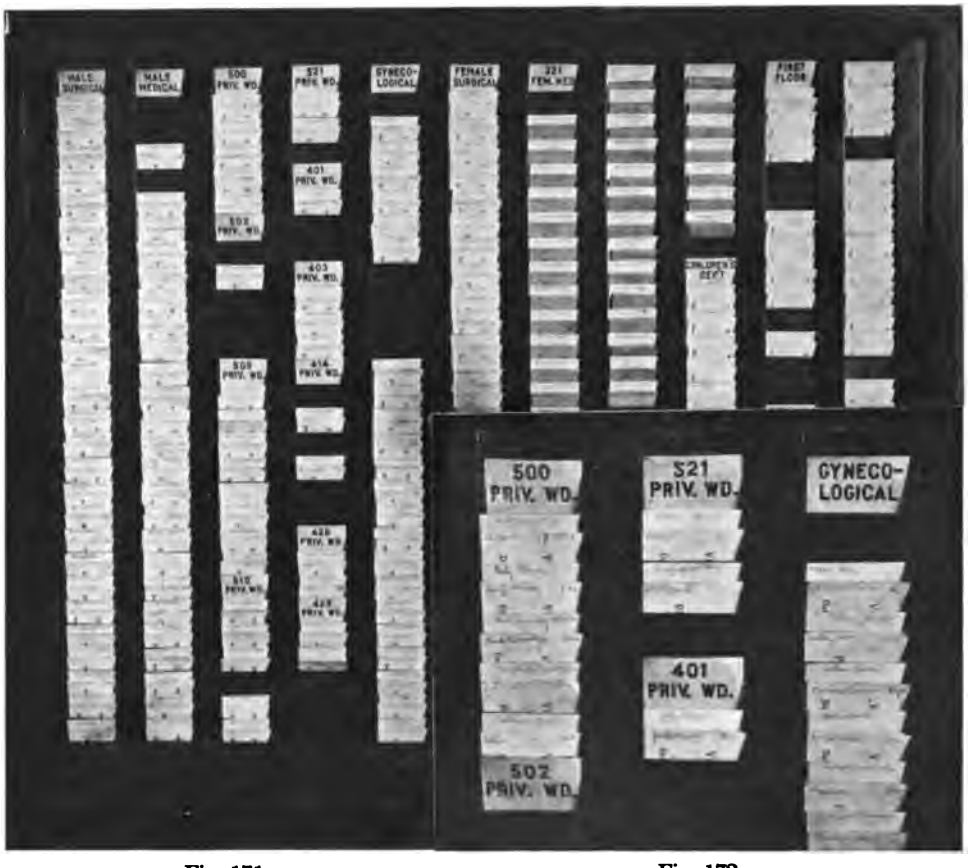


Fig. 171. Fig. 172.

Device for handling visitors. The illustration in the lower right-hand corner shows detail.

effect that the patient will not receive other visitors until this card is returned to the person in charge of the board.

This board has served an extremely useful purpose; it has served materially to limit the number of visitors to each patient at one time; if there are several visitors to a patient at one time, some of them are almost certain to wander about the corridors and other wards and to make of themselves a general nuisance; the net result of this particular board is that several hundred visitors can be handled on each visiting day during the two hours in an orderly and proper manner, and thus a large part of the former terror of the visiting hours has been lost to the nurses and interns and other attendants in the hospital.

THE HOSPITAL TELEPHONE

To the casual observer it would seem an extremely simple matter to make rules for the performance of the telephone service of a hospital; but this is not true, and the telephone service in a large general hospital or in any institution frequented by a good many physicians and patronized by a considerable number of well-to-do people is a complex and technical affair.

The functions of the telephone are easily divisible in a general hospital; nearly all outgoing calls have to do with the purchase of supplies or business concerning supplies for the hospital, unless there is a nurses' register in the institution connected with a training-school, in which case there is a good deal of telephoning about graduate specials. The only other outgoing work of any moment concerns the condition of patients in the shape of information transmitted from the interns or house physicians to the visiting physicians who have patients in the institution; but all this work taken together might be done over one trunk line, and because the outgoing work is performed by employees or other persons in the institution subject to discipline the service could be easily regulated so that the trunk line would be comfortably busy most of the time, but never under any very heavy pressure.

The onerous, exacting, and annoying telephone service of a hospital concerns messages into the house from anxious, inquiring friends, and unless a very tight rein is kept on this part of the service it is likely to assume an infinite number of embarrassing phases, and especially is this true if a considerable part of the clientele of the institution is made up of well-to-do people. Some relative of a patient will call for the special nurse on the case, not only to inquire about the condition of the patient, but to use her as the intermediary for the conduct of all sorts of domestic business between the patient in the hospital and the home.

In a good many institutions there are portable telephones to fit into wall plugs in the rooms of patients, and where patients have access to the phone themselves they grow readily into the habit of visiting over the phone and carrying on long conversations with their friends and with their children.

Some institutions are so situated that they are rather helpless in enforcing anything like a discipline in regard to a telephone service, and are under a moral compulsion to allow the service to grow until it is wholly inefficient, and they then have the other horn of the dilemma, the continuous complaints on the part of the public, physicians, and patients.

It seems that the only cure for the evils of an overburdened telephone service in the hospital is a strict discipline and a limitation of the use of the service within pretty narrow bounds. For instance, it has been found in some institutions that are very well conducted that a slot telephone in the physicians' locker room will do a good deal to prevent visiting doctors from paying some of their morning calls over the telephone, and with slot telephones elsewhere in the house, where convalescent patients and the friends of patients can use the pay machine, another economy and restriction can be practised.

The nurses and interns are great abusers of the privileges of a telephone. Both of these classes of young people are fond of visiting over the phone, but they are, as a rule, not very well supplied with cash, and if they are compelled to pay a nickel to telephone the service will be properly limited in that way.

If the telephone service is a good deal of a nuisance in the hospital, it also serves some extremely useful purposes, besides being a medium for the transaction of the business of the institution with the outside community. One of these avenues of usefulness is as a convenience for busy visiting physicians. In the Michael Reese Hospital, for instance, the switchboard operator acts to all intents and pur-

poses as the office attendant to the visiting physicians. There is a physicians' register located in the neighborhood of the switchboard, where the visiting physicians register as they come into the institution to make rounds, and if their patients or their office call they can be reached at the hospital. The switchboard operator takes the message, fills in the blanks of a printed form kept for the purpose, giving name and address and telephone number of the caller, and, in rare instances, the sense of the message to be conveyed; and if the doctor has his own registry or hat hook the printed slip can be attached to it so he will get it when he comes in. In this way many physicians out making their calls grow accustomed to drop in at the hospital, even when they have no business there, and thus they come to regard the institution as a part of their daily routine, and the next step will be for them to send their patients there. An immense amount of the telephone business of the hospital can be transacted directly with the switchboard operator in conjunction with the "condition book," which we shall take up more in detail presently.

THE PHYSICIANS' REGISTER

A form of "in-and-out" register for visiting physicians is shown in Fig. 173. This register has a sliding "in" and "out" plate for each physician, with his name

Fig. 173.—Register for visiting physicians.

plainly written on it, so that the telephone operator can see it easily; next to the name is a pocket large enough to hold an ordinary envelope or note; so that any

one who wishes to communicate with the doctor can leave a note where he is sure to get it when he enters the building. This board is made by the Universal Register Co., of Chicago, from a design furnished by the Michael Reese Hospital. In some institutions only a book register is used, with a space for the name of the physician, the hour or minute at which he enters the institution, and a similar space to be filled in as he leaves. The push register is the most convenient form, and while it is doubtful whether the difference in time between putting down two or three figures and pushing the board amount to anything, physicians regard it as a hardship if they are asked to sign their names, and so the push board is used instead, and is an index for the telephone switchboard operator to know whether the doctor is in the house, so that she can ring up some particular section of the institution and allow him to talk to his "party."

The registry book is a most serviceable institution under some conditions and is almost necessary; for instance, in the great charity hospitals it is always a difficult thing to get staff members to attend regularly and promptly, and the city or county authorities are enabled frequently to use the in-and-out register as a permanent record of the attendance or non-attendance of men who hold staff positions and who are supposed to give their services at certain hours on certain days. Not long since a considerable number of men attached to one of the largest charity institutions in the country were compelled to resign, because the in-and-out register revealed the fact that they had not been attending to their duties.

The intern registry is an extremely important affair, and serves one of the best disciplinary purposes that can be imagined. Young men are very much disposed to stay out late at night, with the result that their work next day will suffer. If there is a rule of the service naming the hour at which they must be in the institution, the registry book will aid in the enforcement of that rule. A specially ruled year-book, with a page for each day in the year, is best for this purpose. Such books as that can be bought or easily made, or an ordinary diary can be properly ruled for it, affording a space for the name of the intern going out and other spaces as follows:

"Who Answers," "Emergency Telephone Number," "Time Out," "Will Return," "Returned." This means that when the intern goes out he signs his own name and that of his colleague who will answer for him during his absence; the emergency telephone is the number at which he may be found during his absence in case of an emergency; the time out and the time he proposes to return are obviously necessary, and the actual time of return is indicated in the last space when he comes home. Upon the discipline of the institution will depend the usefulness or otherwise of this registry.

There are certain other people who may also be regulated in their goings and comings by this book, such, for instance, as the expert employees who do not live in the institution, as the *x*-ray operator, the experts in the departments of hydrotherapy, pharmacy, laboratory of pathology, milk station, and diet kitchen.

THE CONDITION BOOK

There must, of necessity, be many telephone inquiries about the condition of patients in a hospital, and it is manifestly impossible for the switchboard operator to answer these inquiries intelligently, and it is equally impossible for her to call either the house physicians or the nurses to the telephone to answer such numerous inquiries. Generally speaking, in most institutions the information given out by

the hospital on inquiry of the friends of patients is misleading and unsatisfactory, and sometimes so untrue that great harm is done.

The Michael Reese Hospital has devised what is called a "Condition Book." This book is made up of loose leaves that can be put in or taken out just as in any loose-leaf ledger, and headed as follows:

The pages are 11 by 14 inches in size, and it is ruled and cross-ruled, there being eleven spaces. The first space, 2 inches in width, is for the name of the patient. Each of the other spaces is ⅝-inch wide, and the wording of each of these spaces in the order of its occurrence from left to right is as follows:

"Location"; "Good night"; "Poor night"; "Better"; "Not so well"; "To be operated today"; "Operated yesterday"; "Seriously ill"; "Not seriously ill"; "Refer to head nurse."

The method of procedure with this condition book is as follows: There is a book for each section of the hospital; the night clerk or his assistant writes the name of each new patient entered during the day, inserting a new page for the purpose when necessary. He draws a line through the name of each patient discharged during the day. These books are distributed to the desks of the head nurses at 7:30 o'clock in the morning, and it is the last duty of the night head nurse of each section before going off duty to check these condition books, making a proper check against the name of each patient under her charge. These checkmarks are made lightly with a lead pencil so that the marks can be easily rubbed out with an eraser, leaving blank spaces for the next day.

It was intended, when this system was installed, to have the conditions checked twice daily, in the morning by the night nurse, and in the evening by the day nurse. It has been found, however, that the evening checking is rendered unnecessary by the fact that there are not very many inquiries late in the evening and at night, excepting in very serious cases, and all these serious cases are notified to the switchboard operator by the head nurses on a sheet of paper headed "emergency conditions."

This book has very greatly simplified the difficulties of answering inquiries about patients. It is a very simple affair, and the work of keeping it up is so inconsequential in the matter of both time and labor that its use has been more than justified.

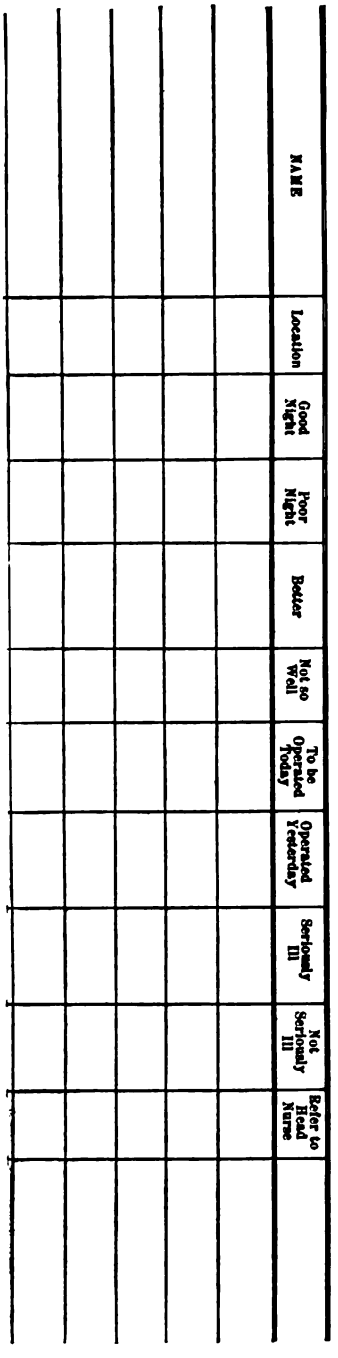


Fig. 174.—Condition book.

CALLING INTERNS FOR ATTENDING PHYSICIANS

In addition to the service of the interns' lighting system, described in the sections on Architecture, these lights have an exceedingly useful office which might well be alluded to here. One of the most annoying things that physicians practising in hospitals have to contend with is inability to obtain the services of an intern when they visit their patients.

In the Michael Reese Hospital it is the custom for the usher at the door to announce to the switchboard operator the presence of an attending physician as soon as he alights from his vehicle. The operator thereupon flashes the light of the proper intern, and, if the intern makes prompt inquiry over some telephone near which he happens to be, he can meet the attending physician either in the corridor downstairs or at the bedside of the patient whom he knows the attending physician is about to visit. The promptness or otherwise of this service will

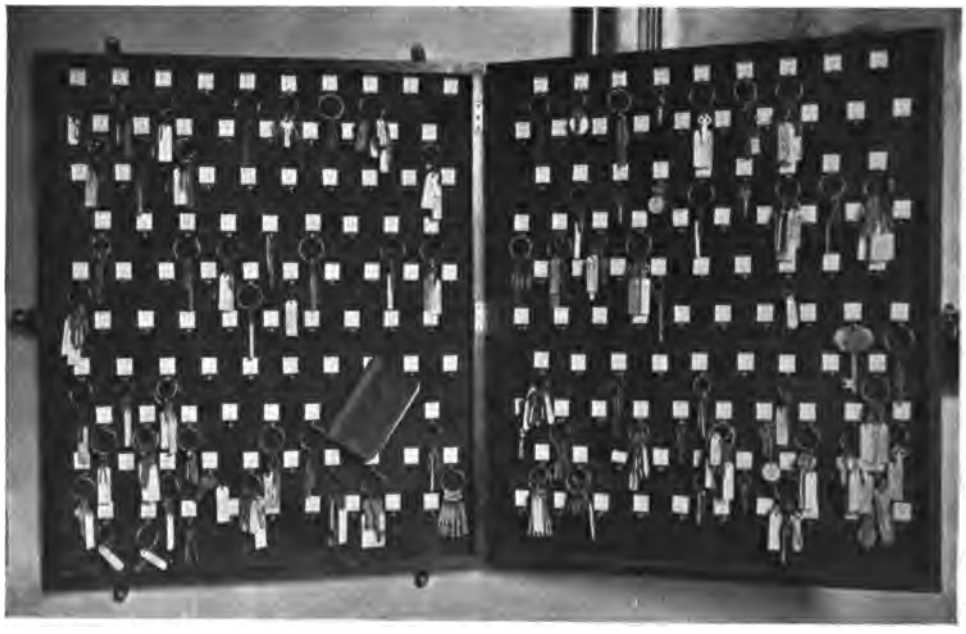


Fig. 175.—Office key-board.

depend wholly upon the discipline in the institution, and upon the enforcement of rules requiring the prompt answer of interns to all their lights.

Naturally, if it is the policy of the institution to cater to the wants of and to save time for attending physicians, this policy can be best met by giving these men the prompt attendance of their interns when they enter the institution doors. There is hardly anything more unsatisfactory to an attending physician than to have to visit his patient unattended, and without the presence of the intern on whom he must eventually rely for the carrying out of his orders, and not only for the carrying out of orders, but in order that he may advise the intern as to the possibilities in the case, of possible emergency, for instance, and what he shall do in case it occurs.

THE OFFICE KEY-BOARD

In every hospital there are many rooms that must be kept locked securely, with the key in the hands of some trusted head of a department. Often the office

may have to get into one of these rooms in the absence of the regular custodian. The attendant may also lose his key. It is well, in fact necessary, for the office to have duplicate keys to every locked room in the house. Figure 175 shows a key-board to meet this phase of administration. It is merely a cabinet of wood, 1 inch deep, lined with green baize or plush, with a lid of same size, shape, and finish, provided with lock and key. Each hook is numbered, and there is an index-book hung from one of the hooks. It is a most satisfactory detail of hospital management.

REPAIRS IN THE HOSPITAL

The question of who shall handle the expert help in the hospital depends on individual conditions. In large institutions, where there is a competent chief engineer, who can supervise the plumber, gas and steamfitter, and electrician,

MICHAEL REESE HOSPITAL

REQUISITION FOR REPAIRS

Date_____191__

To the Superintendent:

Please furnish the following Repairs in

_____Department.
(Give exact location)

_____

_____

_____

_____

_____

_____

_____Head of Dept.

Approved_____

Began_____ Finished_____ Hours_____

Material used_____

_____

_____

_____

By_____

Fig. 176.—Requisition for repairs.

and where there is a master mechanic to superintend the work of the carpenters, painters, glaziers, and plasterers, the problem settles itself.

In small hospitals the housekeeper may have to do all the supervising, give out the work, decide how things shall be done and when.

But, however the personnel and direction of things are arranged, there are many repairs to do, and unless there is a definite system about it there will be much waste of time and much lost material. An excellent way is to have all orders for repairs made out in writing, and have these written orders pass through the office of the superintendent. Figure 176 shows a good form for repair orders. This blank fixes the exact locality, signed by the person who knows about what is wanted, contains a space for the approval of the superintendent, and at the bottom has space for the time employed and the material used, these facts to be signed by the mechanic who does the work.

DISPOSITION OF THE DEAD

The death of a patient in the hospital sets moving as definite a technic as any other professional or scientific incident in the institution's life. Especially is this true in communities where constituted health authorities, either national, state, or municipal, are in control of the people's health and hygiene, and there are certain exactions under these conditions. The first thing to determine is whether the death has come from natural causes, and whether the patient may be buried in the regular course of events. In most large cities hospitals are required to certify to the coroner any case that dies within a specified time, usually twenty-four hours after the patient entered the institution. This does not mean necessarily that the case is one for the coroner's inquiry, but rather one for the coroner's discretion. Many of these patients who die so soon after reaching the hospital have been attended at their homes by the same physician who attends them to the end, and the cause of death would be quite as plain as though the case had remained at home, and the coroner in such a case would inevitably refuse to act and the death certificate would be certified to the health department in the ordinary way. In small communities, where the constituted authorities make no such requirement as this, it is an excellent safeguard for institutions, and prompts them to be overcareful about certifying the death of patients. The reputation of many a fine medical man, hitherto spotless, has been sadly damaged by some innuendo or charge brought by friends of a deceased patient touching the physician's handling of the case, and sometimes such charges are made too late to be counteracted by an inquiry, as, for instance, the patient may have been buried; and it seems to be a favorite amusement in some rural localities for the good people to gossip about causes of death in their midst, and even an institution can be badly smirched in its reputation for hurriedly certifying to the death of a patient.

In very well-conducted hospitals it is the rule for some one in authority, not the physician in the case or an intern or a nurse, but some one connected with the administration of the institution, to see the friends of the dead on the pretense, perhaps, of sympathizing with them, but in reality for the purpose of sounding the frame of mind in which the people are left by their bereavement. At such a moment it is beyond human nature to contain one's self if there is even a lurking suspicion that something was not as it should have been, and a keen officer will find in a moment whether there is any reason why a certificate of death should not be issued. This interview has two purposes, the one just mentioned and the further one of offering aid and assistance to the bereaved family. With hospital people death is an every-day occurrence, but in private homes it is usually rare that the people have to superintend the arrangements for taking care of the dead and for funerals, and usually the friends of a patient will want advice about their conduct of affairs, and the administrator of the hospital can help to this end and the people will be grateful for his aid.

But supposing the patient has died within a few hours after reaching the hospital, and there had been no antecedent medical attention of record; in such a case the hospital would be remiss not to notify the coroner at once, and this would be the case whether the institution is a large metropolitan hospital or a smaller institution in the country, and it will then lie with the coroner whether an official inquiry shall be made or whether the institution shall be ordered to proceed in the usual way, assuming the death to have been due to natural cause. But, in any event, the institution has taken the initiative to call the attention of the coroner to the case, and no possible subsequent inquiry can place the institution at a disadvantage.

Let us now suppose another condition of affairs: Let us say the patient had been in the hospital for days, or even weeks, and that death had been expected and had not come as a surprise, but when it did finally come the family began to talk of incidents in the case and complain of neglect of the patient, either on the part of the attending physician, interns, nurses, or institution authorities; it may be that these complaints are a natural expression of grief; but the institution owes it to itself to suggest to the family of the deceased that the authorities of the hospital are quite as anxious to know if there had been any neglect as the patient's family could be, and that, therefore, there should be an official inquiry into the conduct of the case, and to that end the coroner would be notified. Oftentimes a proposal of this sort will bring the family to its senses, and bring a retraction of any innuendoes or charges that had been made. But, on the other hand, sometimes the family are agreeable to such an inquiry, and in either event the hospital has protected itself and prevented any subsequent scandal from any quarter concerning either the conduct of the case or its disposition after the death of the patient.

The certificate of death when called for is usually in a form prescribed by the local authorities, and in the large communities it has grown to be a very burdensome official paper, oftentimes impossible to fill out to the satisfaction of the authorities, as, for instance, requirement is now made in some cities for a history of the family for two or three generations back, and while such data may be of intense interest it oftentimes requires the summoning of distant members of the family, and delay of days while the certificate is held up and the obsequies necessarily postponed. In some communities the certificate of death swings to the other extreme, and is a very lax and meager affair, containing hardly any information, which will render the statistics of that community wholly worthless from the standpoint of the United States census in the department of vital statistics of the governmental organization, and these statistics are extremely valuable.

When a body is to be buried in the community in which the patient dies the original certificate of death is all that is required, and where a body is to be transported from one place to another, and especially from one state to another, the federal laws come into play, and require that the body shall be embalmed in some prescribed way and sealed in a properly constructed casket, and in some such cases very strict requirement is made for a certificate setting out the exact cause of death, with the intent to prevent the transportation of bodies dead of some communicable disease.

Effects of the Dead.—There are two classes of effects of the dead—the valuables, if there are any, in possession of the hospital business office, under a receipt held by the patient or by the head nurse for him, and the clothing and wearing apparel. When a patient dies it sometimes becomes a matter of concern as to the disposition of these effects, and too frequently there is a contention between relatives or friends as to who shall take possession of them. This contention will rarely come

if there is a husband or wife, children or parents of the deceased, and in such cases it will never be questioned if the effects are turned over to such close relatives; but oftentimes the patient has no immediate family, and the institution should then be extremely careful not to lose possession of valuables that it may be called upon to produce to an executor or administrator, and it is far better to simply hold the effects in such a case, with the explanation that the institution prefers to await whatever legal proceeding there may be of a probate character, and to turn the effects over to the legal representative. There will hardly ever come a question as to the dignity of this position, and even in the fiercest contest for possession of a patient's effects there will come no criticism of the institution if it takes this ground. Sometimes the patient has been brought to the institution by the police, and the police will have taken a receipt for whatever effects the patient may have had, and then, of course, the police can, after the death of the patient, take possession of these effects by producing their receipt, and, as law officers, the police will be entirely responsible custodians, and the institution will be protected in giving up the valuables. The same condition will sometimes exist in coroner's cases, where the police have brought in an accident case and the patient has died. It has happened occasionally that the coroner has demanded possession of the effects of the dead, and the institution can then either produce the effects themselves and turn them over to the coroner, taking his receipt therefor, item by item, or it can turn over whatever receipt it holds for the property that has been surrendered to the police, and then the two legal departments can fight it out among themselves.

Papers to Certify.—It becomes the duty of the hospital, in the ordinary course of business connected with the death of a patient, to certify the death in connection with insurance papers, and usually this is a routine matter, but there are occasions in which it becomes a delicate question just what to do. A great many foreigners in this country patronize the industrial insurance companies, and it is often a habit of these transplanted people to get themselves insured almost as soon as they arrive in this country. Moreover, it very often happens that these people, after they have been here for a time, conclude to change their names, for purposes of euphony or for business reasons. The standards of these transplanted people, especially the lower classes, are not quite the same as those that prevail in this country among the better-to-do classes of people, and they think it is quite in line with ordinary business for them to change their age as well as their names, and usually, when this is done, the age given to the insurance company will be very much younger than the patient really is, because the premium will be less. Such a patient may remain in good health for several years perhaps, and all of a sudden become ill and seek admission to a hospital. He forgets all about his insurance policy, and gives his Americanized name and his real age. When such a patient dies it leaves his beneficiary in quite a dilemma. Naturally, the identity of the patient is at issue in the first place, and this has to be settled; then it transpires that the patient obtained the policy by false representation—that is, by giving the wrong age—and the insurance company, if so disposed, can easily set up the charge of fraud in such a case.

As a rule, this is not done, however, and the industrial insurance companies of the day have recognized that this form of deception is not really deception in the broader sense, but due rather to ignorance on the part of the insured concerning American methods of doing things, and usually such insurance policies have been paid on a certificate from responsible people concerning the identity of the insured; and then, concerning the age, they have usually figured the patient at his correct age, and deducted from the insurance policy such amount as the patient would have

been compelled to pay in the shape of premiums if he had given his correct age. But there is always a great deal of tangle under circumstances such as these, and it has taken time and often a good deal of work to straighten the affair out. So that in a good many institutions, where considerable numbers of foreigners are cared for, it has become a definite part of the admission technic of the institution to make inquiry concerning insurance, the change of names, possibility that the age given at the hospital may not be in accordance with the age given to the insurance company, and so on. It is true these inquiries sometimes frighten patients, and they begin to think about the possibility of death, but they always save the institution a great deal of unnecessary labor and embarrassment, and sometimes vastly simplify the business between the patient's relatives and the insurance companies; thus it would seem to be justified.

It goes without saying that the institution will never be justified in making false statements, either for the benefit of patients or their families, on behalf of an insurance company, either as to the cause of death or the age or name of the deceased.

How to Obtain Autopsies.—Nearly every state in the American Union forbids the making of a postmortem examination of a body, except with the consent of the relatives of the dead. This law is in consonance with a widespread, almost universal, public sentiment against what many people are accustomed to call the desecration of the dead, and the public at large assumes the mistaken attitude that the holding of a postmortem is merely to satisfy an idle curiosity of the physician who attended the patient, and merely to assure him whether he had guessed correctly at the nature of the patient's illness. It is useless to protest to the relatives of the dead that this attitude is not a correct one; that the physician does not want to satisfy an idle curiosity; that his prime object is to identify certain antemortem manifestations with the actual condition of the patient as revealed in the postmortem examination, to the end that the information he secures in this way may be utilized in the future in the interest of the living.

While it is wholly improper to recommend the actual deception of the relatives of the dead in order to obtain a postmortem, it is sometimes justifiable to use collateral arguments, especially when, as in this case, they have for their object a sound, just, and virtuous purpose. Therefore, the wits of hospital administrators have evolved certain plausible propositions likely to result, one way or another, in obtaining the desired postmortem inquiry.

If it is a child that has died, and there are other children in the family, it would seem not wholly an ignoble argument to call the attention of the parents to the fact that the child might have had something the matter with it that partook of the nature of an inherited or family weakness, and that a revelation of the exact conditions might be of immense value at some time in the future when another child should be ill.

Then, again, there is the insurance feature, especially in case of the adult. Many insurance companies have clauses in their policies that are in the nature of "catch questions," and it not infrequently happens that the diagnosis of a case may develop a refusal on the part of the insurance company to pay the policy because of apparent misrepresentations by the insured in regard to his physical condition at the time of insurance or in regard to his family history. It may be admitted that the refusal of insurance companies to pay policies for technical violations of the policy are less frequent than formerly, but they do exist, and this argument will sometimes be a potent one to secure a postmortem inquiry where it is actually justified.

Then, too, if the deceased be an adult and the parent of a family, the offspring have a right to an absolute knowledge of the disease from which the parent died. They may not claim that right, and rarely do so out of sentiment coincident with their grief, but the family physician must think for them, and he has a right to this information, and it is his duty to urge this right out of consideration for the health and future welfare of the offspring.

In isolated cases there are, of course, many other arguments that may be used with all propriety to secure a postmortem examination in a case that has been of sufficient interest and perplexity to raise a question of the diagnosis.

AMBULANCE SERVICE

In the Eastern hospitals, especially in the large cities, an ambulance service seems to be a recognized and uniform necessity. In the west and central west of this country nearly all private hospitals—that is, those institutions that cater to private pay patients only—find it convenient and profitable to maintain an ambulance service, not only because they obtain a profitable fee for each patient they haul, but because oftentimes such an institution may secure a profitable private patient because it has an ambulance immediately ready to transport the patient to the hospital when the call comes.

This question of ambulance service is rather a mixed problem, and in many localities is a perplexing and important one. In some of the large eastern cities, where semiprivate institutions have definite arrangements with the city, county, or state for taking care of free patients under some per capita method, an ambulance is not a distinct drain upon the resources of the institution, because, even for free patients, the hospital is paid a moderate fee for the work of its ambulance, and the question whether or not an institution shall maintain an ambulance can be easily settled on a basis of the individual case. But there are other institutions that receive and take care of a large percentage of free patients without any pay whatever from any source, where the keeping of an ambulance would mean a distinct hardship and would mean no income whatever.

Let us take, for instance, the Michael Reese Hospital in Chicago as a case in point: more than 60 per cent. of the patients of that institution are absolutely free patients, and the funds which support that institution are contributed by nearly 4000 citizens of Chicago. Many of these people make very large contributions, up into the thousands of dollars annually. Many of these wealthy citizens are in touch with large masses of very poor people, who are in many cases dependent more or less upon them. The institution also has for its patients some of the wealthiest and most aristocratic citizens of the community.

The wealthy contributors to the funds of the hospital regard the institution as distinctly a charitable one, which it is, and if the institution maintained its own ambulance service these wealthy patrons would feel that it was the duty of the institution to haul the free patients to the hospital whenever called upon by a large contributor or by a responsible citizen to do so. Most of the free patients of the institution live in the poorer quarter of the city, several miles away, and the admission of these free patients amounts to from ten to twenty per day. It is a certainty that if the institution maintained its own ambulance service, two or more vehicles would be required to haul the free patients alone, and the contributors to the hospital would insist, and justly so, that these free patients should have the first call on the ambulance service, so it would naturally transpire that the institution vehicles would be constantly employed in the hauling of free patients, and

the greater number of ambulances it had the greater would be the call for this free service, and it would follow, of course, that most of the time, when the institution had an opportunity to haul a patient who could afford to pay for the service, its ambulances would be out on a free call, and some private ambulance would have to be employed and that profitable business lost to the hospital.

Therefore, the institution which never refuses to accept a free patient that can be properly admitted has wisely taken the broad ground that, if it undertakes to care for all applicants for free service, it is little enough to ask that those free patients be at least delivered to the hospital without cost to the institution.

Perhaps this illustration may seem personal under the circumstances, but it seems to state the case of a certain phase of ambulance service so aptly that it seemed pardonable to employ it.

Ambulance service is a costly business. Let us take the horse vehicle first, for instance. If the hauls are very short, and the patronage of the institution small, and the ambulance maintained more for parade purposes than actual use, one team of horses and one shift of ambulance men will answer all purposes, because night hauls, under such circumstances, would be so infrequent that the same horses and the same men could do the work; but where the hauling would be over great distances, especially in the rough streets of the average large city, and where the business is great, two complete shifts of horses and men will be required for each vehicle.

A fairly good horse ambulance can be purchased for about $600 or $800. Horses at once serviceable and of good appearance will cost at least $400 per pair, and, if the institution is lucky in its horses and drivers, a good team of horses, working on a twelve-hour shift, hitched to a busy ambulance, will last a year or two, when they will have to be renewed. Repairs on the ambulance will perhaps not be more than $100, or at most $200, per year while the vehicle is comparatively new, but an ambulance will not stand hard usage on the rough streets of a large city and remain in presentable shape for more than four or five years.

Ambulance men, of which there must be two for each shift, will cost about $75 per month each, including their board. So, if we sum up the actual expense incident to the maintenance of a horse ambulance, with a double shift of men and horses, we can figure about as follows:

Ambulance cost and repairs, about	$ 200	per year.
Horses, renewals, about	400	"
Four men, at $900 per year each	3600	"

or a total of about $4200 for annual maintenance.

The item of $3600 for men to man the ambulance seems an exorbitant amount, and, without question, men can be employed for a good deal less money, but it requires intelligence and care and experience and a good deal of technical knowledge to handle sick people on a stretcher, and especially to take them out of the average apartment building and down the usual winding stairs, and to put them in the ambulance so that they will ride comfortably and without untoward results from the trip, and cheap men are not a paying investment for such purposes.

Now let us consider, very briefly, the automobile ambulance: A first-rate automobile ambulance, built to travel the heavy streets of a large city and to go in all kinds of weather, costs between $3000 and $4000, and the greater the initial cost the longer it is likely to last. Automobile ambulances have not been in regular service anywhere long enough to justify any accurate figures as to the life of the vehicle employed for ambulance purposes, but we have a fair guide in the average auto-

mobile used by the busy medical practitioner. His automobile will cost less, it is true, perhaps not more than $2000 on the average, and it has a lifetime of about four years, and it would seem fair to expect the automobile ambulance to do about as well, which would mean an annual cost in the shape of purchase price of about $1000 per year, and for maintenance—that is, repairs, including oil, gasoline, and new tires—about $100 per month, or $1200 per year; and then we have the same ambulance force of men, with the additional expense that at least two of the four men must be competent chauffeurs, giving us an additional cost for operation of $3600, or a total of $5800 per year for cost and maintenance of one automobile ambulance.

There is this further detail concerning the operation of an ambulance, comparing the horse vehicle with the automobile: in northern latitudes, where deep winter snows are likely to prevail, there are many days in the winter time when an automobile ambulance cannot be used. Automobile makers will not concede this; it is true, nevertheless, that there are many days in the winter time when an automobile ambulance cannot leave the garage. Where conditions present themselves, such as they do in New York or Chicago, for instance, the horse ambulance can travel every day in the year. The automobile ambulance, again, is likely to break down, and experience has shown that it does break down at most inopportune times and when human life hangs on the integrity of the machine.

The horse ambulance generally gets the patient to the hospital, if not quite so quickly, as a rule, at least more surely.

Taking these fundamental principles, and these rather conservative figures of cost and maintenance for ambulance service, the administrator of almost any hospital, located anywhere and maintained for the care of almost any kind of patients, will be able to answer the question for himself, whether or not he wants to and can afford to maintain an ambulance service.

The foregoing sections on the business office have to do merely with the physical acts that immediately concern the patient and his admission to the hospital. The further business of the office will be more properly treated under the head of Hospital Accounting, and under the other several headings relative to the purchase, receipt, and distribution of supplies.

HOSPITAL ACCOUNTING

HOSPITAL accounting differs from the bookkeeping of most other business enterprises in that the sources of income are vastly increased in number; that many of the transactions recur at more frequent intervals, such as the operations of the house count and consequent readjustment of patients' accounts; that many of the expense items are contingent and not constant; and in the further fact that the accounts must be carried out and finally summarized into statements and bills for patrons and others not versed in the technicalities of bookkeeping, and for such other purposes as the vital statistics. All these conditions, while they do not complicate or make less accurate any good hospital accounting system, do require details and side entries not common to most other lines of business.

Generally speaking, hospital accounting is very nearly the sum total of two words, income and expense. There are, of course, asset and liability accounts, but the income and expenditure account in the general ledger is the hub upon which the whole system of maintenance and management revolves.

Hospital bookkeeping, perhaps, properly begins with the expenditure side of the transaction, but, assuming that the institution is fully equipped with all the necessary paraphernalia for taking care of the sick, and that the reader has a slight knowledge of double-entry bookkeeping, we will proceed, step by step, eliminating elaborate and complicated details, to tell the story of a system of accounting that is at once unique and simple, which has, in actual experience, proved ample and satisfactory. Let us then begin, first, by taking up the income side of the proposition under the general heading:

INCOME

Income from Pay Patients.—The original entry from which the accounting system of the institution depends for its information regarding the pay patients, such as time of entry, price of room or ward, discharge, etc., is taken from the admission card, which is referred to elsewhere, under the section on Business Management. Besides the revenue from rooms and wards, other sources of revenue from patients are: Undergraduate nurses' fees, board for graduate special nurses, guest charges, operating-room charges, surgery and dispensary charges, *x*-ray charges, telephone, and any sundry charges fixed as a system by the board of directors, including laboratory, hydrotherapeutic department, drugs, special diets, and so on.

Accounts Receivable.—Accounts due from patients is the first detail to be considered, and this group, as heretofore tabulated, when charged to patients, is known as "accounts receivable."

The bookkeeper's first duty in the morning is to open up his accounts from the admission cards, and also note any changes when patients have been transferred to a different room or ward, and to close up accounts of discharged patients. The changes, etc., are attended to by the room clerk, all of which the bookkeeper scrutinizes carefully, for the importance of this is obvious, and an oversight in any one of these details makes the work of rendering accounts a source of annoyance and

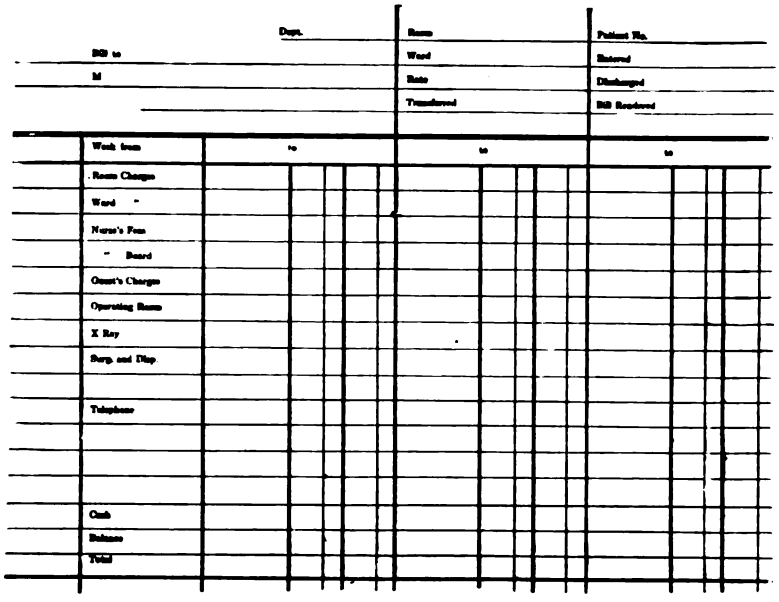


Fig. 177.—Patients' ledger sheet.

Hospital

Chicago, _____ *19*__

In account with

Mr. _____

ROOM AND WARD CHARGES PAYABLE WEEKLY IN ADVANCE

To Room Charges	
" *Ward Charges*	
" *Nurse's Fees*	
" " *Board*	
" *Guest's Charges*	
" *Operating Room*	
" *Surgery and Dispensary*	
" *X Ray*	
" *Telephone*	
" *Sundries*	

Fig. 178.—Bill-head.

trouble to all concerned. The ledger sheet is prepared with appropriate space for the various details, so that one will almost mechanically fall into the correct path when rendering accounts.

A reproduction of a very convenient patients' ledger sheet is herewith shown in Fig. 177, which will accommodate a period of three weeks, which is more than the average length of time a patient remains. In order to save time in writing, both the ledger sheet and bill-head have the items to be charged printed and tabulated. Figure 178 shows a bill-head containing some listed charges (others may be added).

HOSPITAL

_____ 19____

To the Superintendent:

The_____Department has this day furnished on the order of

_____

the following articles service to be charged to the accounts of

_____

_____

Quantity	Article of Service	Price

_____

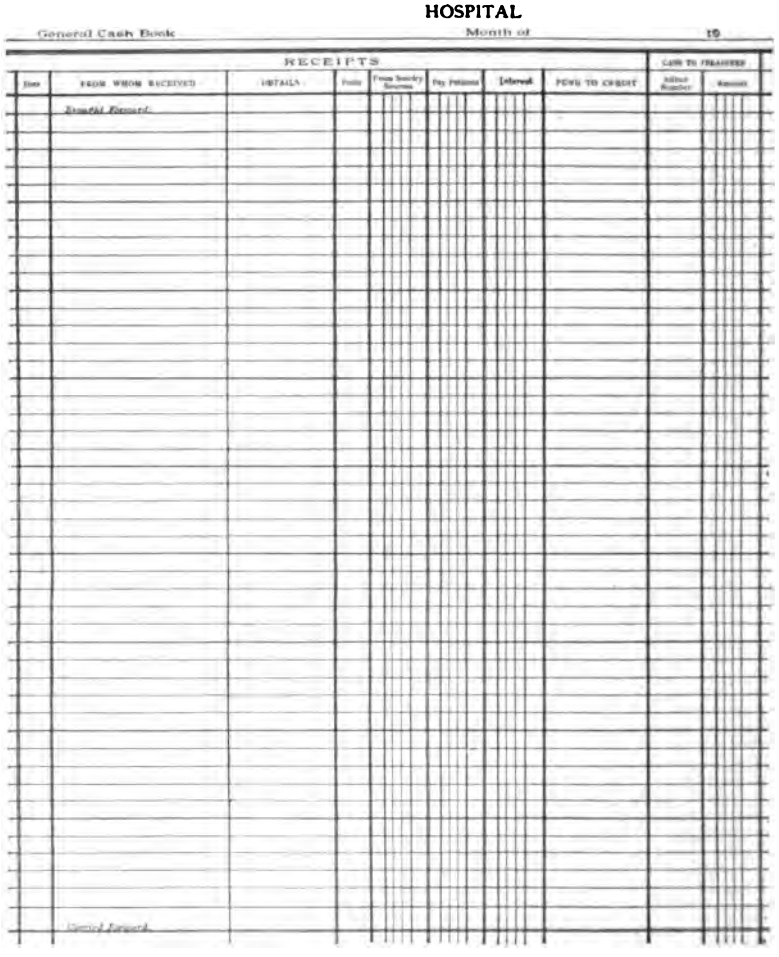
Head of Dept.

Fig. 179.—Charge slip.

The data for all other items to be charged is furnished to the bookkeeping department each morning by the heads of the various departments. A good form for a charge slip to be made out by department heads is shown in Fig. 179.

At the time the patients' ledger account is made out a smaller card is also made, with the date and patient's name on it, for a weekly card system "tickler." To illustrate: A patient enters the hospital on the 10th; his card is filed away to turn up on the 17th; the bookkeeper then has all the bills due for that day before him, it being unnecessary to go through the whole ledger to pick out the accounts which

from patients, just an ordinary cash book, using both sides of the page. Each day's receipts are kept separate and turned over to the treasurer daily and banked. The amounts are entered in the general cash book where all other cash receipts are entered, such as interest on investments, donations, new endowments, loans repaid, drug sales, refuse sales, etc. Totals are posted from a summary at the close of the month into the general ledger. A cut of the receipt or debit side of the cash book is herewith shown in Fig. 181.


HOSPITAL

General Cash Book Month of 19

RECEIPTS

Fig. 181.—Receipt or debit side of cash book.

We will now take up the journal entries in connection with the receipts side of the cash book. The total amount from pay patients is credited to accounts receivable, general cash account being debited. If there are any refunds to patients they are paid in cash, and entered in the petty cash book for advance payments not earned, the individual account is charged with the same, and accounts receivable is debited at the close of the month, general cash being credited. In case the patient has left the hospital without having been reimbursed for advance payments not earned, a check is drawn in the regular way and mailed.

Our accounts receivable account in the general ledger will by this time appear as follows:

Previous month balance (agreeing with balance in patient's ledger).....
Refunds, advance payments.....
Accrued earnings from income register.....
Cash receipts from patients.....
Balance agreeing with balance in patients' ledger.....

The general cash account in the ledger is the controlling account of all cash handled, whether it belongs to the operating account, endowment account, build-

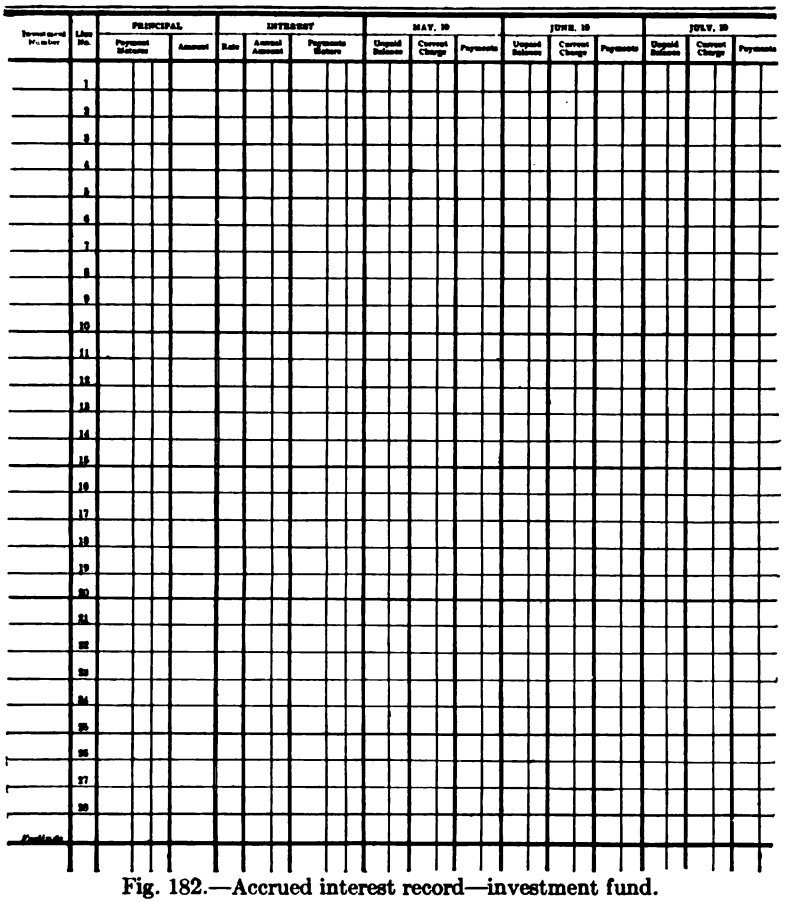


Fig. 182.—Accrued interest record—investment fund.

ing account, special account, or any other cash or fund account which may have been created. It may be suggested that a separate account be opened at the bank for each fund account. The proper journal entry for the total cash receipts is as follows:

Cash Dr.
To Sundry Accounts, Cr.

All the sundry accounts in the above entry having been posted direct from the summary in the general cash book, the credit side is checked, but the debit item or cash is posted to general cash account in the ledger.

we have now covered practically the whole field, and a summary of the journal entries dealing with the disbursements is as follows:

Sundry Accounts, Dr.
To Cash, Cr.

Hospital General, Dr.
To Sundries,
Income and Expenditures, Cr.
Uncollected Earnings (Refunds), Cr.
Unappropriated Expenditures (Insurance), Cr.

Capital, Dr.
To Endowment Fund, Cr.

ANALYSIS OF EXPENDITURES ACCOUNT BOOK

Analysis of Expenditures Account Book.—The classification headings need not be printed, but can be filled in with pen and ink as the case requires.

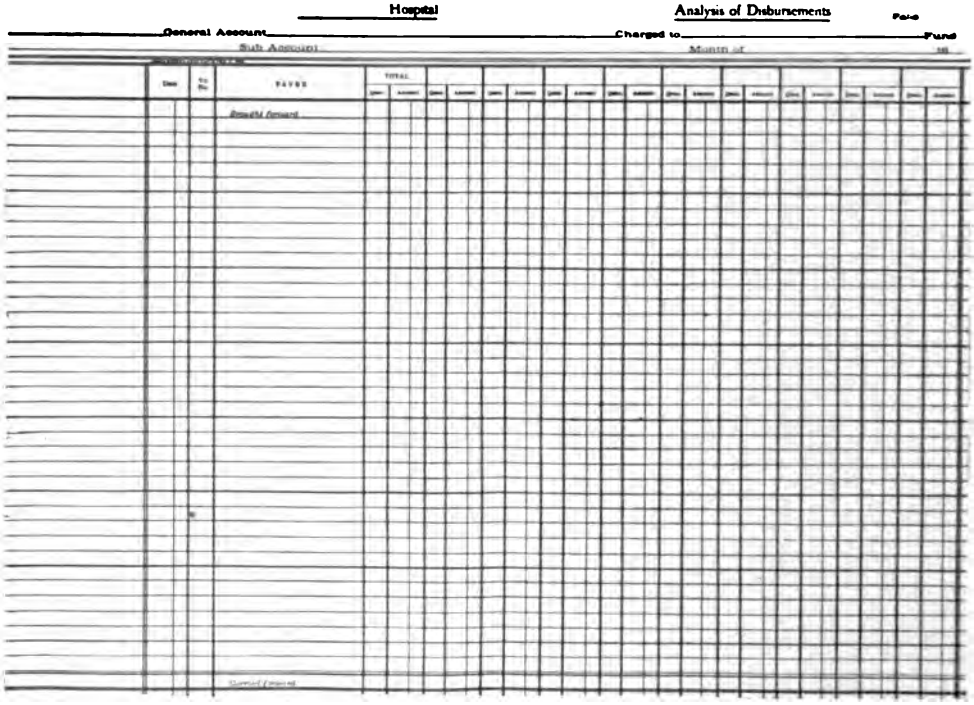


Fig. 185.—Analysis of expenditures account book.

All invoices for supplies purchased should be checked over and certified by the receiving clerk and carefully audited. Monthly statements from dealers should be

required promptly on the first of the month, also checked up with the expense bills and passed on for payment.

The paid bills are entered direct to the expenditures analysis book; totals for the month are posted direct to the general ledger. The aggregate of all the maintenance accounts for the month will obviously agree with the cash disbursements or accounts general in the cash book. A loose-leaf book for this purpose will be found to best facilitate the work; the sheets can be arranged and rearranged to suit as they are being filled up. Some departments require much more space than others.

The expenditures account is classified as follows:

Maintenance.

Provisions:
- Meat.
- Fish and poultry.
- Butter and cheese.
- Eggs.
- Milk.
- Bread and flour.
- Groceries.
- Vegetables.
- Fruit.

Establishment Charges:
- Insurance.
- Repairs on building.
- Taxes and assessments.

Power Plant:
- Fuel.
- Oil and waste.
- Miscellaneous machinery.
- Laundry plant.
- Expenses.
- Ice plant.

Salaries and wages:
- Power plant.
- Office.
- Medical.
- Dispensary and *x*-ray.
- Nurses' training-school.
- Nurses.
- Orderlies.
- Laundry employees.
- Kitchen employees.
- Janitors.
- Maids.

Surgery and dispensary.
- Drugs and drug sundries.
- Appliances.
- Instruments.
- Wines and spirits.

Surgery and dispensary—*Continued*
- *x*-Ray.
- Hydrotherapeutic.
- Laboratory.

Domestic:
- Crockery.
- Silverware and glassware.
- Cleaning supplies.
- Kitchen utensils.
- Hardware and brushes.
- Fuel and light.
- Repairs. This account can be subdivided: Lighting. Elevators. Plumbing. Heating. Laundry plant.
- Operating-room expenses.
- Uniforms.
- Bedding and linen.
- Sundries.
- Furniture and fixtures (repairs and renewals).

Miscellaneous:
- Printing and stationery.
- Postage.
- Advertising.
- Telephone and telegraph.
- Livery.
- Freight and express.
- Sundry.

Management:
- Official salaries.
- Sundries.

Direct charges against income:
- Patients' sundry charges.
- Refunds to patients.
- Accrued interest on investments.
- Repairs on real estate owned.

Hospital directors, at their meetings, should be furnished with detailed financial statements of the income and expenditures of the institution, together with a

balance sheet of assets and liabilities. A very comprehensive income and expenditure statement is herewith shown:

.....Hospital.

Statement of Income and Expenditures.

Date.....

Income.		*Expenditures.*	
Pay patients:		Maintenance:	
Room charges	- - -	Provisions	- - -
Ward charges	- - -	Salaries and wages	- - -
Guest charges	- - -	Domestics	- - -
Operating-room charges	- - -	Surgery and dispensary	- - -
Surgery and dispensary charges	- - -	Power plant	- - -
x-Ray charges	- - -	Rent	- - -
Hydrotherapeutic charges	- - -	Miscellaneous	- - -
Laboratory charges	- - -	Establishment charges	- - -
Milk charges	- - -	Administrative:	
Sundry charges.		Management	- - -
Drug sales	- - -	Excess income over expenditure	- - -
Refuse sales	- - -		
Nurses' registrations	- - -		
Interest on endowments	- - -		
Interest on bank balances	- - -		
Donations	- - -		
Rents	- - -		
	- - -		- - -

.....Hospital.

BALANCE SHEET

Date.....

Assets.		*Liabilities.*	
Property and equipment:		General fund:	
Capitalized expenditure on building and equipment	- - -	Property and equipment	- - -
Real estate	- - -	Uninvested capital assets	- - -
		Total capital	- - -
		Hospital general fund	- - -
		Add excess income over expenditures	- - -
Investments:			
Hospital endowment fund	- - -		
Special investment fund	- - -		
Cash with bankers:			
Uninvested endowment account	- - -		
Special account	- - -		
Building account	- - -		
Hospital general fund:			
Cash at bank	- - -		
Petty cash	- - -		
Accounts receivable	- - -		
Insurance paid in advance	- - -		
Accrued interest	- - -		
	- - -		- - -

One of the most important statements in hospital finances, at least one which is perhaps scrutinized the most, is the comparative monthly statement. By enumerating the items to the left of the page and the months of the year across the top of the page, and supplying the amounts for the various months, a very com-

prehensive and illuminating group of figures will be shown. A reproduction of one of the headings of the comparative monthly statement is as follows:

Maintenance:

Jan. Feb. March. April. May. June. July, etc.

Salary and wages:

Power plant.
Office.
Medical.
Dispensary and *x*-ray.
Nurses' training-school.
Nurses.
Orderlies.
Laundry.
Kitchen.
Janitors.
Maids.

Semi-annual and annual comparative statements can be prepared in the same manner, and some very interesting percentages can be shown.

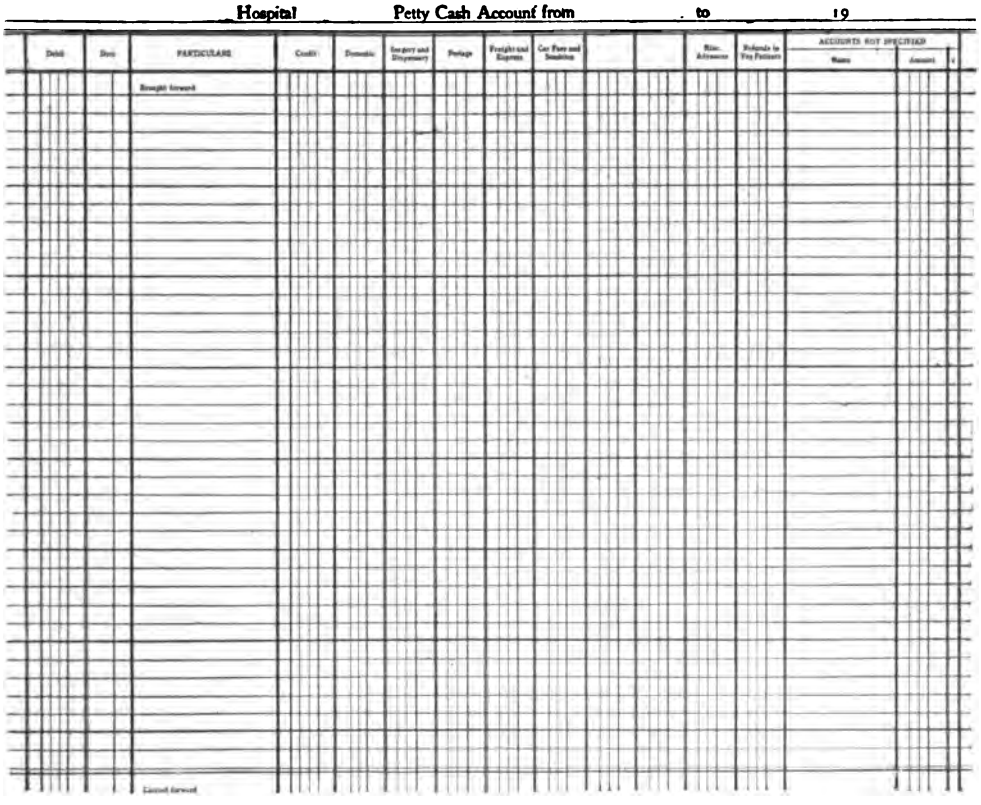


Fig. 186.—Petty cash book.

Another useful statement in hospital management is the schedule shown below of per capita cost of raw food. It is an excellent check on the

commissary department, and shows as well the number of rations issued for the month:

No. of days board issued during May, 1900:
Patients..... - - -
Nurses and interns..... - - -
Staff and help..... - - -
Total..... - - -
Cost of provisions..... - - -
Daily cost of provisions per capita..... - - -

Distribution of cost of provisions:
Patients..... - - -
Nurses and interns..... - - -
Staff and help..... - - -
Total..... - - -

The figures for the above statement are taken (first) for the patients' item from the monthly house count report, which will be taken up later; and, for the other

HOSPITAL

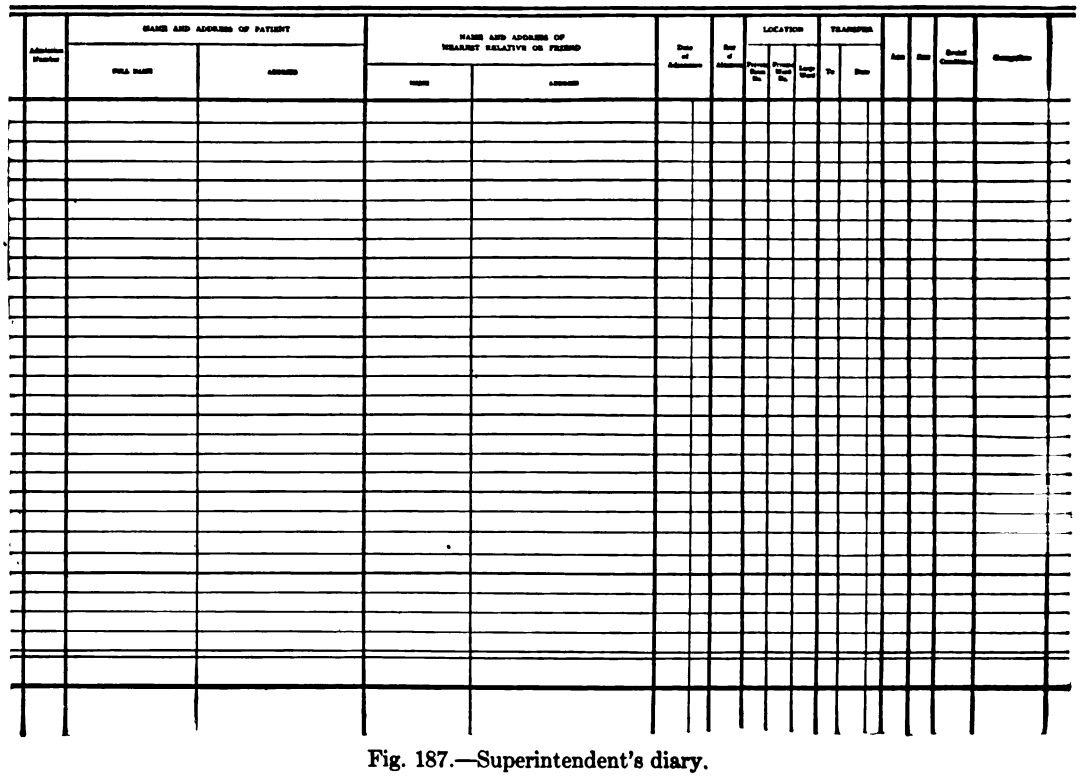


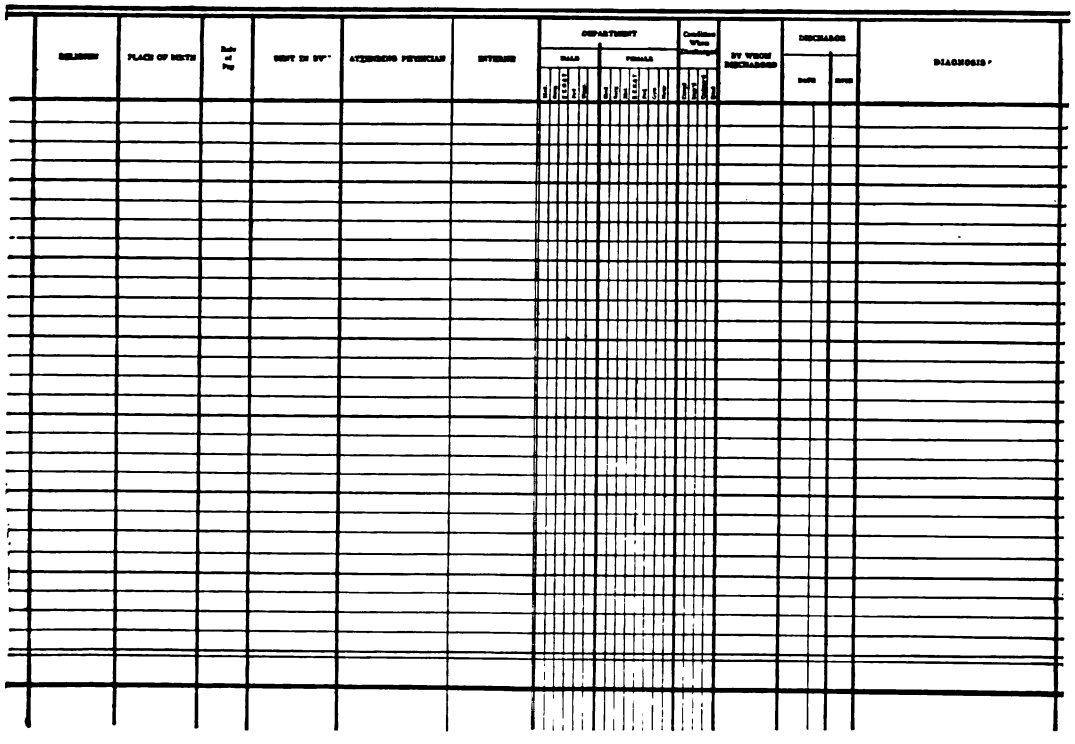
Fig. 187.—Superintendent's diary.

items, from the pay-roll, and by actual count of those on the pay-roll. The total number of nurses and interns, together with the staff and help, multiplied by the number of days in the month, will complete the figures, or, in other words, will give the total number of days' rations served. The distribution of the per capita cost of provisions is simply a matter of arithmetic.

Petty Cash Book.—It will be found that a large number of small petty cash items, such as car fare, freight, and express charges, patients' charges, private laundry, etc., must be paid at once. A very good scheme to handle this class of accounts is to have a petty cash book, with a permanent fund sufficiently large to take care of the business comfortably; for example, we create a petty cash fund of $250. Whenever this amount is used up a new check for a like amount can be issued, and at the end of the month a check for an amount to renew the $250 can be issued and carried forward to the new month. The total for the month of the various items is to be distributed to the proper expense accounts in the disbursement analysis book and figured into the totals and carried to the ledger from there.

At the end of the year it becomes necessary to close the books, and a very simple matter it becomes, for practically all there is to be done is to close all the expense items to the debit side of the income and expenditure account, and all the income items to the credit side of the same account.

SUPERINTENDENT'S DIARY



Regarding asset and liability accounts there is not much to be said, except what would apply to any ordinary business of equal size. By referring to the balance sheet, previously enumerated, the necessary data can be ascertained. If an expenditure is to be capitalized the usual journal entry is all there is to be considered, taking care not to put the amount into the expense account as well.

The trial balance of a running institution at the beginning of the year, all things being equal, would start out with the following accounts:

Debit.	*Credit.*
Hospital Endowment Account.	Hospital Account.
Building General Account.	Building Account.
Real Estate Owned.	Hospital Endowment Fund.
Accounts Receivable.	Hospital General Account.
Accrued Interest.	Special Funds (if any).
Petty Cash Account.	Income and Expenditure.
General Cash Account.	Unappropriated Expenditures.
Unexpired Insurance.	Petty Cash Account.

HOSPITAL HOUSE COUNT

Admission cards for the day are not filed away at once, but are kept together in a compartment separate from those previously attended to and already filed alphabetically. The cards of patients who have been discharged, and all transfers from one locality to another during the day up to 12 P. M., are also kept in this compartment. The night clerk writes up the superintendent's diary and compiles the house count of patients admitted, discharged, transferred, births and deaths, if any. In the superintendent's diary a permanent general record of each patient is kept, and, together with the index to same, furnishes a condensed and ready means for reference, and contains nearly everything in the shape of records, outside of the clinical record and history, pertaining to the patient, from admittance until discharged, whether the patient pays for the accommodation or not.

Following the completion of the last census, the government experts found fault with most of the vital statistics kept in the institutions of this country, on the ground that they were wanting in certain essentials; notably, there were not sufficient family histories to aid in calculating the sources of certain diseases, such as cancer, goiter, and tuberculosis. The government sent out a great number of special investigators, whose duty it was to set in motion the machinery for better accounting in the future. Undoubtedly, institutions should attempt to obtain histories to the third generation wherever possible. In some of the large cities the health authorities compel the hospitals to include in their death data the birthplace, length of residence in the country, and character of occupation of at least two generations back of the deceased.

The diary furnishes data for the house count, which is compiled daily at midnight, and is entered upon six forms.

FORM 1, HOUSE COUNT. *November* 3, 1911.

Admissions.		Births.	Discharges.		Deaths.	Transfers.	
Free	2 4	1 5	Free	2 8			
$8	0		$8	2			
$15	1		$10	1 1			
$25	1		$25	2 3			
$35	1 1						
Total	9	6		19			

Upon this form the admissions, discharges, and transfers for the day are shown, together with the births and deaths.

FORM 2, HOUSE COUNT. *November*, 1911.

Kind of accommodation.	Date 1.	Admission.	Discharge.	Date 2.	Admission.	Discharge.	Date 3.	Admission.	Discharge.	Date 4	Etc.
$90											
$85	I			1			1			1	
$75	1			1			1			1	
$60		1		1			1			1	
$50	*1* 3			*1* 3			*1* 3			*1* 3	
$45	*1* 1	1		*1* 2			*1* 2			*1* 2	
$40	*2* 2	*1*		*3* 2			*3* 2		*1*	*2* 2	
$35	*6* 2	*1*	*1*	*7* 2	*1*		*8* 2		*2*	*6* 2	
$25	*15* 13	1	*1*	*14* 14	1	*2* 3	*12* 12	*1* #1	*1*	*12* 13	
Private Total rooms.	*25* 23	*2* 3	*1*	*26* 26	*1* 1	*2* 3	*25* 24	*1* #1	*4*	*22* 25	
$18	*1* 4	#*1*	*1* 1	*1* 3			*1* 3		1	*1* 2	
$15	*2* 4		#*1*	*1* 4	1		*1* 5	1	1#1	*1* 4	
$12	*6* 4	#2	1	*6* 5			*6* 5	1	2	*6* 4	
$10	*12* 17			*12* 17		*1* 1	*11* 6	1	*2*	*9* 17	
Private Total wards.	*21* 29	#*1* #2	*1*#*1* 2	*20* 29	1	*1* 1	*19* 29	3	*2* 4#1	*17* 27	
$8	*4* 6	2		*4* 8		2	*4* 6			*4* 6	
Free.	*15* 178	11	*1* 7#2	*14* 180	*3* 9	*2* 8	*15* 181	*3* 8	*2* 9	*16* 180	
Total male.	236	16	9	243	11	14	240	11	13	238	
Total female.	*65*	*2*	*3*	*64*	*4*	*5*	*63*	*4*	*8*	*59*	
Grand total.	301	18	12	307	15	19	303	15	21	297	

Note.—Roman figures, male; italic figures, female.

Vertical division: Rate admission; discharge; date, continued across to the last day of the month.

Horizontal division: Rates of private rooms, total patients in private rooms; rates of private wards; total patients in private wards; free patients; total patients; grand total.

To illustrate: The first "date" represents the first day of the month. This column shows the number of patients in the hospital at midnight of the past month's last day. On Form 1 the admissions, discharges, and transfers of the first twenty-four hours of the new month are found, which are placed against the figures in the first "date" column, under the headings admissions and discharges. The number of patients in the house at midnight of the first day of the new month are placed in the second date column. These figures are checked against the room clerk's register, straightening out discrepancies on the room board if any. Transfers are marked by prefixing an X.

FORM 3, HOUSE COUNT. *November*, 1911.

Date.	$90	$85	$75	$60	$50	$45	$40	$35	$25	Total P. R.	$18	$15	$12	$10	Total P. W.	$8	Free.	Grand total.
1		1	1		4	2	4	8	28	48	5	6	10	29	50	10	193	301
2		1	1	1	4	3	5	9	28	52	4	5	11	29	49	12	194	307
3		1	1	1	4	3	5	10	24	49	4	6	11	27	48	10	196	303
4		1	1	1	4	3	4	8	25	47	3	5	10	26	44	10	196	297

The headings across the top of the page are the prices of the various classes of accommodation in the hospital—prices of rooms and wards.

The first column down the page is made up of the days of the month, and day by day the figures carried across the page will be made up of the number of patients occupying the various priced rooms and wards and the number of free patients; the total of the day's tabulations across the page, showing the number of patients of all classes in the house, will be the last column for the day.

FORM 4, HOUSE COUNT. *November*, 1911.

	Admissions.								Discharges.							
	Male.				Female.				Male.				Female.			
Date.	P. R.	P. W.	$8	Free.	P. R.	P. W.	$8	Free.	P. R.	P. W.	$8	Free.	P. R.	P. W.	$8	Free.
1		3 #1		10	1	#1	1	2	2	1	#1	18	#1	1		
2	3	#2	2	11	2					2		7 #2	1	1		1
3	1	1		9	1			3	3	1	2	8	2	1		2
4	#1	3		8	1			3		4 #1		9	4	2		2

The vertical divisions show the number of patients in private rooms, private wards, and free wards, and the horizontal divisions show the days of the month and the number of patients admitted during the day to the several classes of accom-

modations in the house. Discharges are entered on the right half of the same page in the same way. This form deals with changes of the day.

FORM 5, HOUSE COUNT. *November*, 1911.

	Male.				Female.				
Date.	P. R.	P. W.	$8	Free.	P. R.	P. W.	$8	Free.	Total.
1	23	29	6	178	25	21	4	15	301
2	26	29	8	180	26	20	4	14	307
3	24	29	6	181	25	19	4	15	303
4	25	27	6	180	22	17	4	16	297
									1206

This form deals with patients in the house according to their accommodation. The first column down the page is the days of the month; the headings across the page are made up of private rooms, private wards, and free wards, and the totals carried to the extreme right of the page are made up of all classes of patients in the house at the close of that day, and these totals must agree with the same totals on Form 3.

FORM 6, HOUSE COUNT. *November*, 1911.

	Medical.		Surgical.		Obstetric.		Gynecologic.		Total.		Births.	Deaths.
Date.	Adm.	Disc.	Adm.	Disc.	Adm.	Disc.	Adm.	Disc.	Adm.	Disc.		
1	3	5	6	6	8	6		5	17	22	*1* 5	Johnson. Baby. Hemophilia. Free male. 11/1.
2	7	3	8	5	1		2	4	18	12		Jones. Baby. Premature birth. Free male. 11/2.
3	4	3	2	5	8	10	1	1	15	19	*1* 3	Chas. Brown, 1359 Newberry Ave. Coroner's case. Free male. 11/4.
4	2	9	5	7	5	4	3	1	15	21	*1* 3	
Total												

This form shows the classes of diseases, and may be elaborated or constricted to conform to the demands of health authorities, or for purposes of the annual report of the vital statistics of the institution.

The first column down the page is the days of the month. The headings across the page are the classified diseases intended to be tabulated, and totals are given. In this form are also carried columns for births and deaths for the purpose of the superintendent's reports, shown in No. 12, and also for the purposes of reports to the health department of the municipality.

SUPERINTENDENT'S REPORT

This form may be used for a report to the directors, for a daily report form for any purpose, or for the annual report, statistic or otherwise:

SUPERINTENDENT'S REPORT

From 12 P. M. October 31st 1911 to 12 P. M. November 4th. 1911

PATIENTS IN HOSPITAL	AS PER LAST REPORT	SINCE ADMITTED	BIRTHS	TOTAL	DISCHARGED	DIED	TOTAL	REMAINING IN HOSPITAL	NO. OF DAYS TREATMENT
MALE FREE	186	27	11.	224	39 m.a.	3	42 m.a.	180	719
" $8.00	7	2		9	2 m.i.		2 m.i.	6	26
" Private Wards	26	7 m.s.		33 m.s.	8 m.i.		8 m.i.	27	114
" Private Rooms	25	4 m.i.		29 m.i.	4		4	25	98
SUB-TOTAL	244	40 m.4	11	295 m.4	54 m.4	3	57 m.4	238	957
FEMALE FREE	13	8	3	21	5		5	16	60
" $8.00	3	1		4				4	16
" Private Wards	21	m.i.		21 m.i.	5		5	17	77
" Private Rooms	25	5		30	7 m.i.		7 m.i.	22	98
SUB-TOTAL	62	11 m.i.	3	76 m.i.	17 m.i.		17	59	251
TOTAL	306	51	14	371	71	3	74	297	1208

Cash Receipts . . . $_____

Number of Employees Boarded at Hospital _____

Number of Employees Boarded and Lodged at Hospital _____

Outstanding Accounts "A" $ _____

Outstanding Accounts "B" $ _____

Total $ _____

Fig. 188.—Superintendent's report.

Hospital

Summary of Cash Receipts and Disbursements — General Fund

	MONTH	MOS. END.
Cash on Hand beginning of period		
Bank Balance overdrawn		
Cash Receipts:		
From Operation (Actual)		
" Int. on Endowment Fund (Actual)		
" Annuities Charities		
" Donations		
" Rent		
TOTAL RECEIPTS		
Cash Disbursements		
Bank Balance overdrawn		
Cash on hand, end of period		

Endowment Fund

	MONTH	Jan 1, 19— To
Fund beginning of period		
Additions		
Fund end of period		
Interest on Endowment Fund due next month		

Statistical Information

	MONTH								MOS. END.					
	PATIENTS IN HOSPITAL				DAYS TREATMENT		AVGE DAILY NO. OF PATIENTS		NUMBER OF ADMISSIONS		DAYS TREATMENT		AVGE DAILY NO. OF PATIENTS	
	Previously Reported		Admissions		19—	19—	19—	19—	19—	19—	19—	19—	19—	19—
Private Room Patients														
Private Ward Patients														
$8.00 Ward Patients														
Free Patients														
Total														

	MONTH		MOS. END.	
	19—	19—	19—	19—
Total Operating Income				
Average Income per Day Treatment - Pay Patients				
Total Expenses				
Average Expense per Day Treatment - All Patients				

Fig. 189.—Financial statement.

Obviously the figures for this report are taken from one or other of the six foregoing house-count forms. On the back of the reports may be tabulated, for the benefit of the directors or subscribers, any special figures desired, such as the number of private rooms occupied or the number of free patients in the hospital.

Proof of correctness of the report: The sum of the number of patients at the beginning of the period covered by the report and the number of admissions,

Hospital

Statement of Income and Expenditures of General Fund

For _____ 19__, and _____ Months Ending _____, 19__

With Comparative Figures for Previous Year

	MONTH		MOS. ddo.	
	19__	19__	19__	19__
INCOME				
From Operations				
Room Charges				
Ward Charges				
B&B Ward Charges				
Nurses Charges				
Gowns Charges				
Operating Room Charges				
Surgery and Dispensary Charges				
X Ray Charges				
Hydrotherapeutic Charges				
Milk Station Charges				
Laboratory Charges				
Drug Sales				
Return Sales				
Nurses Registrations				
Sundry Charges				
TOTAL Income from Operation				
From other Sources:				
Annuities ; Charities				
Interest on Endowment Fund				
Interest on Bank Balances				
Donations				
Rents				
TOTAL Income from other Sources				
TOTAL Income all Sources				
EXPENDITURES				
Maintenance:				
Provisions				
Salaries and Wages				
Repairs and Renewals of Equipment				
Surgery and Dispensary				
Power Plant				
Establishment Charges				
Rent				
Miscellaneous				
Administration				
Management				
TOTAL EXPENDITURES				
Excess Income over Expenditures				
Excess Expenditures over Income				

Fig. 190.—Financial statement.

together with births, must equal the sum of the number of patients remaining in the hospital at the end of period covered by report and the number of discharges and deaths.

FINANCIAL AND STATISTICAL STATEMENT

It is becoming more evident every year that prospective donors of large amounts must be convinced that the charities for which their gifts are required are being

conducted along sane and safe financial paths, and that their administrators are making good use of the funds already intrusted to them. Then there are subscribers on the regular rolls of many charities who demand accurate accounts of stewardship as the price of further and continued gifts. Some of these charities are beneficiaries of funds from corporations, cities, counties, and states, as well as from private or public service corporations, and their responsible heads also want to know what is being done with the funds they are contributing. To satisfy all these classes, who have a right to exact answers to the questions they are asking, at least by inference, and for the purpose of attracting further and larger gifts, a form of financial statement that may be interpreted at a glance is most desirable. Sheet No. 13 is such a form, one that has met the demands of most exacting business men.

PURCHASE OF SUPPLIES

Who Does the Buying and How?—The question of who shall purchase the many different kinds of supplies for an institution is involved in that other and more important question of the ability and responsibility of the various heads of the departments. Large hospitals have a steward, but that officer usually purchases food supplies of a perishable sort only, and the other supplies, such as surgical and medical apparatus, instruments and material, linens, drugs, supplies for the laboratory of pathology, for the engineering department, and for the janitor's service—all these must be bought by some one else, as a rule. In the small hospital naturally nearly everything in the institution will be bought by one person, and if that person has ability as a buyer the supplies will be bought right, at least from a financial and physical view-point of the institution. In some institutions, especially large county and other charitable institutions, nearly everything, from a paper of pins to the year's coal, is purchased by contract and through a county or municipal purchasing agent.

It may be very well questioned whether any of these methods of buying are just exactly the best way to get the best results. It would seem that the pharmacist could buy what he needs better than anyone else if he is the right sort of man, and it is certainly true that a woman, if she is of the right sort, can buy linens, tableware, bedclothing, blankets, patients' gowns, wrappers, shoes, kitchen utensils, and all such things better than anyone else, especially if she is in touch with the departments where these things are used.

Who could possibly buy operating instruments and surgical supplies quite so well as the head nurse in the surgical department, who is in constant daily contact with the surgeons who do the operating, and who knows just what they want? And who can properly buy supplies for the laboratory of pathology so well as the pathologist himself? And yet all this purchasing must be done in a businesslike way and under a definite system, by which receipts of goods, invoicing, billing, and the bookkeeping can be kept well in hand.

In some institutions the administrative officer appoints a particular day in the month for the purchase of supplies of all kinds; he has his heads of departments make requisitions for what they want, invites merchants to bring samples of their goods, and he buys from the samples. He can send for the head of any department whose judgment he may like to have. This system, however, is limited to purchase by sample; oftentimes by visiting a store one can see something he would very much prefer to what he has been accustomed, and no such opportunity is allowed if the samples are brought to the institution. Moreover, there is a very great objection to purchasing supplies on stated days. In the hospital, like everywhere else, advantage ought to be taken of bargain days in various directions, and if we are going to buy, no matter what condition the market is in, on a specified day of the month, we must take our chances on what is offered that day and at the regular prices.

Almost every day the representatives of many mercantile houses visit institutions for the purpose of selling goods, and it often happens that great bargains are offered. Some of us are fortunate enough to be in so close touch with some

of our tradespeople that they will call us over the phone occasionally and notify us of some special offer; if we confine ourselves to a special day to purchase, we are not in position to take advantage of these sporadic offerings. Then, again, if we wait until our stock is low we deprive ourselves of an opportunity to look around and shop in a leisurely way, and we all know very well that if a merchant has any notion that we are in immediate need of a thing he is likely to be much more independent than if he feels that we do not care whether we buy or not, and that he is likely to lose the trade by allowing us to shop further; in that way we are oftentimes able to obtain bargains, especially if it is in a commodity that we can buy in large quantities and that will keep indefinitely, such as soaps, glass and chinaware, linens, gauzes and cottons, blankets, and the like.

It would seem that a very much better system can be employed, one that is employed in some well-conducted institutions. Goods in these institutions are bought on requisition, made out by heads of departments by whom they are to be used, and this requisition is laid on the desk of the administrator of the institution to be disposed of as that official may see fit. The following is a requisition form of this sort:

HOSPITAL

Please quote this

No. 3980

on your invoice.

Please deliver the following or advise promptly inability so to do:

	QUANTITY	DESCRIPTION	PRICE

DATE

_____ 19__ _____ SUPERINTENDENT.

Fig. 191.—Requisition form for supplies.

As may be seen, it is numbered serially, so that people who sell goods to the institution can give the requisition number on their bills. The requisition is made in book form in blocks of 100, with the original sheet in white paper, and the carbon in some other color and perhaps of a cheaper paper. The head of the department making the requisition does not put the name of the firm from which the articles are to be purchased, but heads of departments are instructed to make out a separate requisition for each kind of goods to be bought, so that, if desirable, the superintendent may fill out the head of the requisition, forward it to some one merchant, and order the bill from him. In the Michael Reese Hospital it is the custom to have one of these requisition books in the hands of the chief engineer, the superintendent of nurses, the housekeeper, the pharmacist, and the director

of pathology. The requisition blocks are fastened into one of the ordinary spring-form holders, made in the proper size and shape, with the name of the department to which it belongs on the cover. The department head makes out the requisition whenever goods are needed, and forwards it to the superintendent, who may either purchase the supplies himself, over the telephone or in person, or he may sign and return it to the department head from which it came, with the name of the department head written diagonally across the face of the requisition in pencil, indicating that he or she is to personally purchase the goods ordered, using the requisition as the order on the merchant and as authority to make the purchase in the name of the hospital.

At the end of the month, or whenever the bills are to be approved by the superintendent, all these requisition books are laid upon his desk, and by reference to them he may settle the question of the purchase price or quality or quantity of any goods ordered, and compare these with the invoices and statements covering the accounts.

Constant watchfulness must be practiced in the purchase of perishables, fruits and vegetables especially. It is a common practice with many marketmen to sell one crate of goods to a purchaser on the spot and to deliver an entirely different commodity. Sometimes this is not deliberate deception. Some one else may come along presently, buy and take away with him precisely the same samples, and the merchant will find later that he has not a sufficient amount to make the hospital delivery as ordered; the temptation will be very great to substitute "something just as good."

Of course vigilance at the receiving room will protect the institution against such dishonesty, and the goods can be ruthlessly returned, and there will be a counter temptation on the part of the steward to delay the return of the goods until they are spoiled for the merchant, but very often they are wanted so badly and so soon that there will not be time to make the exchange, and the indifferent things will have to be used.

There is a better way to guarantee the delivery of the goods purchased, and that is to establish a reputation among marketmen for quitting for good a merchant who is caught cheating. If there are a few examples of marketmen, scattered about the town, who cannot sell the institution a penny's worth of anything, and, if the institution's bills are paid promptly and the trade worth having, it will not be long before the market ethics, at least so far as that institution is concerned, will be on a pretty high plane.

THE STOREKEEPER

All goods purchased for an institution should be received by one person—the storekeeper employed as custodian of the institution's stocks of every sort. All goods purchased should be accompanied to the hospital by the invoices, which state specifically quantities and qualities and designate in detail what the goods are, and no matter who the purchaser was, whether the superintendent himself, or the steward, or the head of one of the departments, all goods should be received in the storeroom of the institution, signed for by the storekeeper, who checks them from the accompanying invoices, either by weight or count, before they are signed for. The storekeeper should immediately notify the business office of the receipt of the goods, and through this channel the head of the department ordering them is notified of their receipt, and can then requisition them out of the storekeeper's custody, this requisition being signed also by the superintendent of the institution

or some one delegated by him. At the close of the day's work the storekeeper should send all invoices received during the day to the accounting department of the institution, accompanied by a list of the receipts and distributions for the day, made out in a form as indicated by Fig. 192.

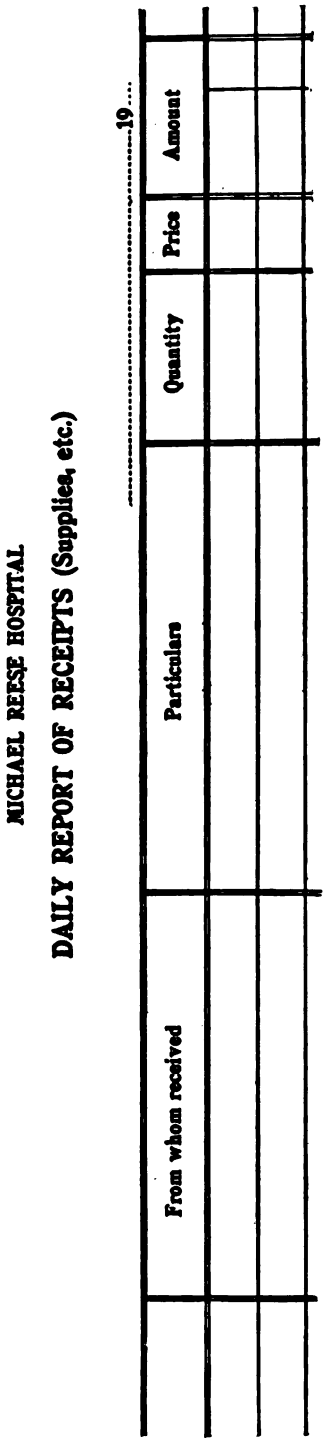


Fig. 192.

Following these papers just one step further in the accounting department, these invoices are filed from day to day under alphabetic heads by names of mercantile firms, and the receipt and distribution sheets are kept in folder book form by dates. At the end of the month the invoices are all attached to the monthly statement, and the statements with their accompanying invoices are sent by the accountant to the head of the department to which they belong for O. K. or comment. For instance, the goods may not have been satisfactory, and it is desired that they be returned, or, indeed, they may have been returned, and it will be the part of the head of the department to so state on the invoices involved, although such return is also shown on the storekeeper's daily report and noted by the accountant.

At the time set for the approval of the bills the superintendent of the institution has before him, for his information, the monthly statement with the checkings of the accounting department, the invoices upon which the statement is based, each invoice being approved or disallowed by the head of the department involved, and the requisition books covering the purchases of all the articles. In this way the accounts for the month can be carefully checked, and it will hardly happen that a mistake can be made by all the people who have handled each separate account.

The keystone to the purchase of supplies and their proper distribution is the personnel of the storekeeper. Nearly every one in the institution will undertake to obtain supplies from the storekeeper without proper requisition, and upon his strength or weakness will depend the integrity of the stockkeeping department.

Stock Inventory.—There is a very grave question in hospital administration whether stock inventories shall be kept. Some of the greatest mercantile houses in the world make no effort to keep an inventory of stock, on the ground that the expense of keeping the inventory properly will vastly overbear any possible losses from a failure to keep such an account. In some institutions there is a careful

stock account kept, but it is very problematic whether such an account is of any very great value. Undoubtedly it is convenient for the superintendent of an institution to be able to go to a card index and see the state of his stock in any item at any time, and some administrators urge this card-index inventory system, because it keeps them posted as to the amount of supplies that are being used, and it keeps them posted in regard to stocks from day to day, but the accounting department likewise keeps them posted from month to month, so that the difference is not great in the course of a year. One is not liable to run short of stock in any particular department, even without a card index of stock, because the heads of departments are keeping their own accounts separately and in their own simple way, and they will announce by new requisition from time to time the low state of stock in any item.

In small institutions, where one person does the buying and also keeps the stores, it may be found convenient to keep a card index of all but the daily food supplies. There should be a space for additions to stock whenever received and other spaces to indicate withdrawals on requisition.

PURCHASE OF MEDICAL AND SURGICAL SUPPLIES

Gauze and Cotton.—Three, possibly four, kinds of gauze should be used in the institution if we are to get the most economic service. First, we must have a finely woven, rather heavy gauze for bandages if the institution makes its own bandages. Some institutions use a very much lighter bandage than others, and some use a heavier bandage in the narrower widths than in the broad widths, and this is a matter that the surgeons will have to determine finally. The next mesh of gauze is for sponges and packs in the operating-room. All these pieces must be hemmed on the edges, to keep threads from falling into the wound and setting up inflammatory conditions after the operation, and about 20 by 30 mesh gauze will answer this purpose very well. Then there is a third quality of gauze, and in some institutions the third and fourth quality are merged into one, but it would seem a little better practice to have, say, a 20 by 24 mesh gauze for the first dressings and for dressing patients with open wounds in which the threads are likely to get into the wound. The very coarse mesh gauzes are loosely made of short fiber cotton, and in cutting there are nearly always short threads left. The fourth quality, 16 by 20 mesh, is the great bulk of the gauze used in the institution for dressing and operating-room purposes. This gauze forms the outer dressings. It is the gauze used to soak up fluids in drainage operations, and in some institutions it is used instead of oakum in cases of fecal fistulæ, though the oakum, while not quite so absorbent, is very much cheaper, and can consequently be changed oftener, and it will retain its antiseptic condition very much longer than any gauze.

Let us now very briefly discuss the economies of bandage material. We can buy very excellent bandages already made up and fastened with a pin for about 40 cents a pound most of the time, and we can buy the gauze needed to make that much bandages, and of the right texture gauze for about $3 per 100 yards when raw cotton sells at 15 cents a pound; or if we do not buy very large quantities, up into the hundreds of thousands of yards at a time, it will cost $3.25, and these figures are so nearly the actual cost of the cotton in the bandages, not counting the labor and losses of rolling, that it is hardly conceivable that it will pay us any longer to roll our own bandages.

For sponge and packing purposes, gauze can be purchased at about $2.25 per 100 yards, that is 20 by 24 mesh, but, where only small quantities of this are

needed, we have to pay a larger price. In some institutions that roll their own bandages the bandage gauze is also used for sponges and packing, and perhaps this is just as well, because much larger quantities are bought, and thereby the price is reduced. The cheaper gauze runs from $2.25 down to $1.90 per 100 yards, excepting at those peculiar commercial periods in which the cotton market is being manipulated either by the growers or the mills, and these periods are alluded to for the purpose of suggesting to hospital administrators that it will pay them well to watch conditions in the cotton market, and especially to watch the New York cotton quotations as indicating manipulation of the commodity; for instance, as this chapter is being written it just happens that the mills in the East have shortened their operating season, and have made an agreement to curtail production something like 25 per cent.

The best way to buy cotton for almost any purpose is to buy in very large quantities, enough to last a year or more, when the price is right. There is very little opportunity to manipulate the fiber of gauze cottons, and we can usually expect that hospital gauzes will be made up of a fairly long fiber cotton. Once in a while some one mill may turn out an immense quantity of a short fiber material, and take the chances of marketing it before the fact of its inferiority is recognized. A magnifying glass will discover this method of marketing to be an inferior one.

The purchase of absorbent cotton is based upon practically the same principles as those involved in the purchase of gauzes. Hospital cottons of all sorts are packed in small packages and made up into bales of 100 packages. It is fairly presumable that the mills themselves send out an evenly graded cotton of the absorbent kinds, especially where the mill brands are attached, but there is no question that very often these cottons reach us in an absurdly different condition than was represented to us when the commodity was bought. We sometimes pay 15 cents for a hospital cotton, whereas we might have purchased another cotton called hospital cotton for 2 cents less, and then find on opening a bale that the high-priced cotton is of so short a fiber that it is practically a waste. Hospitals ought to return such goods. They are fraudulent, and we cannot be made to keep them and pay for them.

But there is a vast difference between brands of long fiber absorbent cotton, and shipments of the same brand in different seasons will prove vastly different, especially in the quality of absorption. We may readily detect this difference by taking two pieces of as nearly the same size as the naked eye can detect and drop them into a basin of water, without squeezing the particles together. If the two samples are taken from the same bale they will usually submerge at exactly the same time, but we may take two samples again, out of two different bales, that look exactly alike, but one sample will submerge a definite length of time ahead of the other, indicating a better power of absorption. This difference is due to poor cleaning of the cotton and poorer treatment. Cottons can be easily bleached without being well cleaned, and it costs a good deal of money to clean cotton properly, and the proportion of waste is increased vastly in the cleaning process; therefore, the mills can make money by palming off poorly cleaned and poorly bleached absorbent cotton, and some of them do so. We should all test our cottons before purchasing, and, if we are purchasing large quantities by sample, we ought to make very careful tests of the absorbtive properties as well as fiber lengths, and these tests ought to be made under the eye of the representative of the mill, and the weight of the samples ought to be taken exactly, and the exact time that it takes them to be submerged in water ought to be taken, and there ought to be many samples tested in this way—a dozen or more. For given weights the time of submergence will be practically the same in all the samples out of a single package. Then, if a differ-

ent cotton is shipped to us on the order which we give at the end of these tests, we have a recourse and can refuse to receive the inferior stuff.

LINENS AND COTTONS

The kind of linens to be used in institution service will depend on a good many conditions, and we must take these conditions into account when we purchase these commodities. For a large charity hospital, for instance, there are very coarse but very strong fabrics that will last a long time, and that can be purchased at prices far below the finer woven fabrics and those woven in figures. Sheets, spreads, pillow cases, and table linen can all be had in this coarser, cheaper grade of goods that will stand the wear and tear of the laundry, because, after all is said and done, it is not the wear that institution goods receive that destroys them, but the laundry. Take, for instance, an institution where the linens are in constant circulation, that is, where there is not sufficient quantity to allow any of them to rest on the shelves, these things will be busy almost every day. It isn't the use of a sheet for a few hours on a patient's bed that wears it out—it is the hard service of going through the laundry, first in the counting, next in transportation to the laundry, rough handling in the recount, then through the washer and then the wringer, then the mangle, and, finally, the folding and transportation back to the linen room, and the counting and recounting for distribution to the auxiliary linen departments of the institution and the handling of the nurses in putting on and taking off the beds. So that, when we buy linens for an institution, we must consider the laundry service as almost the prime factor influencing our decision in the quality to be purchased. For private patients and in small, well-disciplined institutions, where there is a careful watching of the linen, we can, as a rule, afford better qualities of goods—in fact, we cannot afford cheap goods at any price. And even for the use of the public wards and in charity hospitals we cannot afford to use the cheap, flimsy, short-fiber cottons and linens. These wear out too quickly to make them serviceable at any price.

We have said something about those institutions in which the linen supply is so short that the goods are kept constantly in motion, and there is not enough to allow them to rest any time on the shelves. The advantage and disadvantage of keeping the fabrics in motion presents a real problem in institution management. We are often asked the question, "Which is the best economy in the long run, to keep things moving and to be short of stock most of the time, or to have plenty of stock on hand and keep the shelves of the general linen-supply rooms filled?" Perhaps the solution of the question will be a personal one, and will rather concern the rigidity of management and the care and watchfulness of the people using the stock than a question that can be settled by any hard-and-fast rule. This suggestion might be made, however: Everybody using material of any kind in an institution is very much more apt to be wasteful if it is generally understood that there is plenty more where that came from than where it is the common knowledge that the stock is low and the things hard to get. Especially does this temperamental attitude prevail with the nurses, and even more especially with the graduates who may be on private cases in the institution. These young women will generally requisition about all the supplies that they think they can get, and a good many of them will work overtime to see that their supplies are used up. But if they know their linen requisitions are going to be cut, and made to conform to the judgment of the head nurse in charge of the supplies or the women of the linen room, they are very much more apt to think twice before they wipe up a spot of blood with a

clean sheet and then throw it in the spoiled linen receptacle. And if the linen is known to be scarce, the nurses will be very much less apt to use clean sheets under Kelly pads for soaking up the dressing waters, and the same will be true of the towels and pillow slips and all of the other linen supplies.

Now, let us go back for just a moment more to the quality of linens and cottons. In a final analysis of cost, there are two features in fabrics that make up the expensiveness or cheapness of the goods; one of them is the weight of the material, because the raw material is sold by the pound, and the other factor is the amount of mill work put into the goods. A third factor, perhaps, is the quality of the fiber used, but this factor may also be included in the pound price of raw material.

There is no economy whatever in buying short-fiber stuff for any purpose whatever, whether it be curtain material, bed linens, or even floor-mops. A great deal of short-fiber raw material is essentially a waste product. It is woven, in its final treatment in the mills, into tight and apparently very good threads, and these threads are made into apparently very good cloth, and there is only one way to detect the short-fiber material, and that is a process of actual dissection, by taking a magnifying glass and a needle and by raveling out a thread here and there and then by untwisting the thread. This is a delicate process, but it pays handsomely to make these dissections of linen, cotton, and woolen fabrics. We may set it down as a definite rule that short-fiber stuffs will not last, and that they, of all others, are the ones to go to pieces in the laundry. Processes of manufacture are so perfect nowadays that there is no telling by even the finest trained eye whether a piece of goods is made of short or long fiber, except in the process of dissection alluded to.

BLANKETS

There are several considerations surrounding the purchase and use of blankets for institution service. Where we must equip the beds of private pay patients we can hardly afford to quibble over the price of blankets, and we must buy the kind that will not only give the greatest, but most comfortable, wear under the existing conditions. It is impossible to wash or renovate a part wool and part cotton blanket and have it retain that peculiarly soft, luxurious feel that it had when new. It might be said, however, that even the very best of wool blankets can be quite as readily spoiled in the laundry as the cheapest sort of cotton-wool. But no care can ever bring a cotton-wool blanket through the laundry and leave it fit for a luxury-loving patient's bed. So it would seem that about the only thing we can do is to buy an all-wool blanket for private patients. And if we are to concede so much, let us go one step further and have bright, cheery patterns in our blankets for the private patients. If we have a children's department, the same general rule ought to be adhered to. The blankets ought to be all wool and in cheery patterns of bright colors.

Good all-wool blankets that will be satisfying to rich people, who are paying enough in the institution to justify what they have been accustomed to at home, cost all the way from $3 to $5 for a 5-pound double blanket, and the prices are going up rather than coming down. This isn't all that these blankets cost, however, because they must be renovated frequently, and few institution laundries are equipped to do this cleaning of all-wool blankets and to make them come back again into the fluffiness so delicious in a sick bed; and, if we are to have these blankets cleaned by people regularly engaged in the business, and who can do it as experts, the cost will vary from 20 cents for a single blanket up to 40 or 50 cents for a pair, and we have to be very careful about the business house to which we

entrust our all-wool blankets, because many of them are spoiled in the cleaning. It will not do to clean these blankets once or twice a year, because well-to-do people are also fastidious people, and they do not care to use blankets that have been used by others, and especially by other sick people. There is no telling when an infection may be carried from one sick bed to another by the common use of blankets. We would hardly think of giving a sheet to a patient that had been used by another patient, and it is common for us to explain this by the suggestion that sheets are placed next to the body while blankets are not; but this is only partly true. Oftentimes a blanket is up about a patient's neck, and the patient breathes into the body of the blanket, and oftentimes parts of the naked body do touch the blanket; so often, in fact, that it is unpardonable to ask a patient to use a blanket that has been used by some one else until it is renovated and cleaned or at least thoroughly sterilized.

In the wards of the hospital we are confronted with a somewhat different problem. We want, it is true, to use a comfortable blanket for the sick, but we must also think of other considerations—for instance, the length of wear that we must get out of it, and the fact that we must wash the ward blankets in our own laundry. Therefore, they must not shrink too much when they are washed, because in the very best of our institutions the laundry work will shrink blankets.

A blanket composed of about 40 per cent. of wool and about 60 per cent. of cotton is commonly used on the ward beds, but there is a queer thing about this sort of a blanket. Almost all of the 40 per cent. of wool that the manufacturers guarantee to us is in the nap of the goods—in other words, if the nap were all taken out, which is pretty much the case after the first wash in the average laundry, we have about 10 per cent. wool or less, and the rest of the blanket is a very loosely-woven cotton fabric. That kind of a blanket doesn't look like very much after it comes out of the laundry, because it loses most of its nap there. These 40 per cent. wool and 60 per cent. cotton blankets cost about $2.50 for a 5-pound pair. They last a great deal longer than an all-wool blanket on the ward beds, but it isn't by any means because they are better blankets. It is rather because we are satisfied with a tolerably poor blanket on our ward beds. The fact of the business is that if we undertook to use an all-wool blanket on the ward beds and then attempted to maintain any sort of asepsis and regard for the rules of cleanliness of our patients, we could not at all afford to use an all-wool blanket because of the great cost of frequent cleaning. If the average laundry undertook to clean or wash an all-wool blanket it would shrink about one-fourth of its dimensions with each wash, until it would soon fit the children's beds. And, after all, it seems that we are almost thrown back upon the necessity of accepting the shoddy cotton-wool blankets for our wards, and then make the very best bargain we can out of the transaction by washing the blankets in water that is not hot enough to shrink them. In other words, all the blankets, whether they be wool or cotton, will have to be washed in cold or, at best, lukewarm water to prevent them from shrinking, and then, under the very best of conditions, the mixed blanket is pretty apt to lose most of its woolen constituent.

COATS, GOWNS, MANTLES, AND UNIFORMS

There are three forms of white garments used in the institution for ordinary wear in addition to the white uniforms of the interns, head nurses, and heads of departments. The first, the surgeons' operating gown; the next, the visitors' house coat, which is also worn by the surgeons and physicians of the institution

in making their rounds; and third, the mantle, a sleeveless garment, made almost like a pillow case, with a hole in one end for the head and without sleeves, for visitors in the maternity and children's departments and in the operating-rooms.

These coats and gowns are usually made of a drilling, or Indian head, but there are many qualities of both of these grades of cotton goods. Drilling signifies nothing, and Indian head signifies hardly more, since either of them can be bought for almost any price, and it may need to be suggested only that, whether the garments are made of drilling or Indian head, the very best material should be used, which means the highest prices must be paid, because these garments are very frequently sent to the laundry, not because they are soiled, but because it is supposed that they may be unsterile, and unless the cloth out of which they are made is of the very best they are soon torn to pieces.

The operating-room gowns are usually opened in the back, and the best ones are tied with tapes, one at the neck, one at the waist line, and one in between. The gowns reach to the knees of the surgeon, and if they are made with half-sleeves they will last very much longer, and the laundry account will be reduced materially, because the surgeon can then pin on a new sleeve for each operation without having to remove the whole gown. Of course, some surgeons go through a whole morning's work with one gown, whether it be a sleeveless one or has long sleeves, but in some institutions it is a part of the technic of the operating department to change the surgeon's sleeves with each operation and with each change of gloves.

There is very little to be said about the *hospital visitor's coat*, excepting that it should be made of full sizes, and there ought to be a sufficient number of sizes to accommodate the largest as well as the smallest men, and due allowance should be made in the purchase for shrinkage, which will be great. These visitors' coats should be made with some regard for pattern, which makes an excellent impression on the observer if the physicians and surgeons going about the institution have on well-made and well-fitting coats, and the contrary impression is made when the men have ill-fitting, buttonless coats. And this brings up the question of buttons. There is no button, of course, that will go through the laundry. Pearl buttons are out of the question for this reason. Tapes do not look well, and physicians and surgeons will not tie them, but will jerk them off, as they are sure to get in the way, and there seems, therefore, to be only one form of fastening, and that is the brass snap button. This button in time mashes down in the mangle and refuses to snap, and the surgeons' coats will finally gape open; but the coats will usually last about as long as the buttons, and if the buttons happen to wear out first, they can be renewed in the linen rooms.

Both these forms of hospital clothing can be purchased at almost any figure we care to pay, ranging from $12 up to $24 a dozen, and if we patronize a reliable firm, or pick our own material carefully, the $18 or $20 or even $24 coat will be the cheaper in the long run, as against the inferior material that will be put into the cheaper coat.

The *visitor's mantle* is rather a simple affair, and can be made with a yard-wide piece for the front, and another for the back, running practically straight from the knee to the shoulder, leaving an opening at the top merely large enough for the head. The larger these mantles are made, the longer will they last, because, after they have been through the laundry a few times, they will tear easily in the tugging process of getting a tight one on. These articles are worn by outside visitors, by visiting physicians, and students in the operating-rooms, to the end that they may not unsterilize things with their hands or clothing, and by lay visitors, parents, and friends in the maternity and children's departments of the institution. They

are by no means expensive, and a good seamstress can make a dozen or a dozen and a half in a day in the linen rooms, or any good tailoring house will probably make them cheaper than they could be made in the institution if orders for a gross or more are given at one time. They should take about 3 yards of yard-wide goods at the outside, even in the larger sizes, a yard and a half in front and the same for the back.

Uniforms.—Some institutions use cloth of the finer kinds for uniforms for some of their more conspicuous employees, such as elevator men and office boys, and if these uniforms are of good cloth of a lasting quality, with brass buttons and gold braid, they will cost about $12, and there will not be very much saving at any price under that because it will be at the expense of the quality of the goods. There are other employees of the institution that must have more serviceable working uniforms, and a very excellent cloth for these cheaper uniforms is the U. S. Army khaki or a lighter weight of the same goods. The browns and buffs of khaki are not pretty, but it can be bought in olive greens and the dull shades of blue. In the Michael Reese Hospital an olive green, light-weight khaki uniform with brass buttons, fastened with rings into worked button-holes, and braid of a slightly darker color, is worn by orderlies, elevator men, and the office boys. This makes a serviceable uniform at a very low price—about $3 per two-piece suit. The trousers and sleeves must be made very long to provide against shrinkage, and they will be all the better if the ends of the sleeves and the trousers have an extra hem so that they can be let out. The shrinkage is mostly in the length.

If the men are charged for these uniforms and required to turn them in when they give up their employment, and are also compelled to turn in the old ones for new ones, without any additional price, they can be kept in very serviceable and presentable shape. The men will not want to wear them after they are faded and look badly, and, as they do not have to pay for the second suit, they have no hesitancy in asking for a new one. It is the custom to give these employees an order for, say, three or four suits of these uniforms, and then require them to take care of them. They do not fade very much, and the direction of fading does not leave them with that washed-out look about them so common in the blue or the cheaper overall patterns.

The men who do rough work, such as the yard men, kitchen helpers, garbage men, window cleaners, wall washers, and the like, can be made to wear the heavier patterns of brown khaki, and the floor men can be put in overalls of any presentable pattern, and they look very much better than will the men who go about the place in nondescript clothes, oftentimes in their shirt sleeves, and with dirty shirts at that. These overalls can be bought in quantities, and in very good material, for about 50 cents per piece, or $1 for the two-piece uniform, and these overalls wash very well, as a rule, and especially if they are washed without being boiled or bleached.

ENAMELWARE

The enamelware for the wards and private rooms is of the utmost importance. The principal item is the bed-pan, the other items being chiefly urinals, male and female, and the care of these two utensils is secondary only to the kind of utensils themselves.

Bed-pans have been a problem ever since the days of the old yellow earthenware shovel-shaped bed-pan of our grandfathers. There is only one made that justifies mention, and that is the "Perfection" bed-pan, made by Meinecke Company of New York. The price of this pan is something more than $3 each, even in very

large quantities, and, aside from the monopolistic rights of this utensil, the price of $1 would allow a handsome margin of profit. Its chief point of advantage is the ease with which patients are accommodated upon it, whether they lie down or are in a reclining position. Then, again, the contents do not spill readily, it cleans easily, and is carried from one place to another with facility.

There is a small bed-pan, known as the Eureka, a few of which should be kept in the hospital for special cases and convalescents who can move themselves about easily.

Urinals are usually made of enamel for institution work because of the immense breakage when they are made of glass. Male urinals are very difficult to clean, and if they are not carefully cleaned the fact is not manifest except by the odor, because of the difficulty of seeing inside of them. There is a glass male urinal made that must come more into vogue, largely because it is graduated on the outside, and the amount of urine can be accurately measured without pouring it into another vessel. This is a good deal of saving of time, especially on the medical wards, and among private patients suffering from diabetes, Bright's disease, and other kidney involvement. Their disadvantage, of course, is that they cost a good deal and break easily.

Racks for the care of bed-pans and urinals are almost as important a consideration as the vessels themselves. There is no rack made that answers the purpose intended, and shelves set firmly an inch away from the wall, so that they can be kept dry and clean, are the best receptacles for both of these utensils. Usually speaking, the vessels are put away wet after being cleaned, and if the shelves are covered with anything at all, it should be with the stain preparation used for the laboratory tables, the formula for which is given in the section on Pathology, Or they may be kept in a metal cabinet, such as is shown elsewhere, provided there is ventilation in the cabinet.

IRRIGATORS AND GLASSWARE

Irrigators, large or small, whether intended for the operating-room or for continuous irrigation at the bedside of the patient, or for the service of dressing-rooms, are mostly of glass. They are carried on stands high up, and in some cases on carts, and they are nearly always carried so high that one cannot see into them, and they are more than likely to be dirty, or at least carry a sediment, unless they are of clear glass, so that the least particle of dirt will show through. Then again, if they are of glass, the reading of the thermometer will be easy without its removal.

While we are on this subject of irrigators, it may be well to discuss a new method of maintaining temperature in irrigating water, devised by Dr. L. A. Greensfelder, of the surgical staff of the Michael Reese Hospital. This form of irrigator is nothing more nor less than an ordinary quart or half-gallon thermos bottle. Figure 193 shows one of these thermos irrigators, the method of operation being as follows: There is a rubber cork made to fit tight, with two round holes for the glass tubing; there is a fastening on each side at the bottom of the bottle, with a wire or string drawn through for fastening the bottle to the head of the bed or to a raised standard. The rubber tubing is attached to the glass tubing, as shown in the illustration, and the bottle is filled and hung bottom side up. With the ordinary drop method of continuous irrigation the quart thermos bottle will last about three hours, and with some operators four. The water in the bottle will not vary more than 2 degrees in temperature in the time necessary to empty it, and by its use we do away with the necessity to surround the ordinary glass irrigator with hot-water

bottles, or to maintain temperature by a thermo-regulator or some other device, such as hot packs, hot sand-bags, and the like.

An electrotherm is offered for irrigating purposes, but an even temperature cannot be maintained without the closest watching. Besides, they are more costly than the thermos bottle, as they are very frequently out of order, whereas the thermos bottle is always ready for work, barring a fall sufficient to break the glass bottle inside. This does not happen very often, and manufacturers of thermos bottles charge about $2.50 for fitting them with a new bottle when one is broken. The electrotherm costs nearly twice as much as the thermos bottle, and will burn out so much more frequently than the thermos is broken that there is hardly a comparison financially between the two pieces of apparatus.

Fig. 193.—The Greensfelder thermos irrigator.

For purposes of cleanliness, enema points, irrigating points, connecting points for rubber tubing and female catheters should be made of clear glass. If such dressing as packing, iodoform, and combination gauze, nail-brushes for operating- and dressing-rooms, sand soap, and gloves are kept in glass jars, cleanliness and asepsis are more likely to be observed than if the containers for these items are made of material that will not allow of complete inspection at all times. Some day some one will make of glass a liquid-soap container for operating- and dressing-rooms, one that will release a sufficient amount of soap to serve the purpose without wasting it, and that will not get clogged and refuse to work on every occasion. There is no such piece of apparatus made at the present time. Those that are to be had have what the salesmen call "good talking points," but uniformly they lack good working points.

MISCELLANEOUS RUBBER SUPPLIES

Sheets and Blankets.—The rubber sheet is much smaller than the blanket; the blanket is intended to cover the whole of the bed, whereas the rubber sheet is intended to cover the space ordinarily covered by the draw sheet, that is, under the body or trunk of the patient, to save the mattress and to catch whatever secretions may emanate from the body. Both these articles must meet the same general requirements; that is, they must not tear easily, and they must preserve their integrity, not only in contact with the bodily secretions, but in the presence of acids and oils—especially the latter—and drugs generally. There seems to be no rubber sheeting made that will stand up in the presence of oil; the reason for this is that the oil enters into combination with the resin of the rubber, vulcanizing it, causing it to harden, curl up, and peel off. The cruder the rubber in these

goods and the less refined the more resin there is left in them, and, as it costs money to take resin out of rubber, these excess resin rubbers are cheap in proportion as the amount of sulphur is great.

The price of rubber is not always a test of its virtue, but honest firms that fix the values of their goods on honest conditions will ask more for pure rubber than for indifferent or poor rubber, and, so far as we know, there is only one test, and that is actual experience. Some of us have bought rubber sheeting as low as 70 cents per yard, and have paid as high as $2.50 per yard within the last few years. As a general rule, and if the dealer has been honest, the $2.50 goods give better service in proportion to the money invested than the poorer goods; in other words, a good sheet at $2.50 per yard will last longer than three or four of the poorer kinds, assuming that the poorer ones have been used consecutively, one after the other, by the side of the good sheeting, and at the same kind of service.

It may be doubted whether much depends on the color of rubber sheeting. Some dealers who make a good maroon sheet claim virtues for that color. Some who make a white sheet claim that the absence of coloring dyes makes for purity, and that, having no chemical dyes, the rubber itself lasts longer than in the other colors. There are other makers who believe black rubber to be the best. There is not very much to these claims, the known integrity of the makers, based upon past experience, being the best guide. There is just now a sheeting, maroon in color, at $1.10 per yard in quantities of 500 yards; this includes, of course, considerable discounts from list prices, based on the size of not only the one order, but all other orders given at the same time for other classes of rubber goods. Meinecke, of New York, sells the best rubber sheeting, and at their best prices it will be found most economic. Of course there is a great deal in the quality of the cloth used in rubber sheeting, and this quality can be tested by its tearing properties at the time of purchase, and if the rubber itself is of such quality that it will not break or curl the cloth itself will retain its strength very well.

There is on the market a sheeting, rubber on one side and cloth on the other, that sells for the ridicuously low price of 35 cents per yard. It may be used for protective pillow-cases or for sand-bags, but such use will be very inconsequential and hardly worth while. It is much better not to have a poor rubber sheeting about the premises, because there is great danger of carrying infections in the cloth side, which cannot be cleaned readily, and, in any event, urines and other stains soon render the goods unfit for use.

Just here we might mention another substitute for rubber sheeting—namely, a heavy canvas treated with a tar-oil preparation to make it waterproof. It is ill-smelling stuff when brand new, and does not improve with an admixture of urine and feces. If heat sterilization is attempted the surface preparation becomes sticky and the whole sheet runs into an impossible mass.

Other Rubber Goods.—There are other rubber goods that enter into the equipment of the operating- and dressing-rooms and the wards of the institution—the Burr bath sheet for tubbing typhoids, the Kelly pad, used mostly for bed dressings, invalid rings, water- and ice-bags, tubing, bandages, and catheters.

It goes without saying that these goods must be subjected to acids and dressings of various sorts, and to whatever oils may be used in connection with them—such, for instance, as the enema oils—and for the same reason that oils destroy sheeting and blankets, they also destroy these other classes of rubber goods.

The principal thing to guard against in the use of ice-bags and caps, bath caps, and rubber urinals is weak joints and exposed points that are not reinforced. It will not do to assume that, because a water-bag seems to be reinforced on the

outside, that it must necessarily be reinforced inside, and, as in many items of hospital supplies, we must in a large way trust to the honor of the manufacturer for the quality of the goods.

A third class includes the tubing of various sorts, including soft catheters and French catheters, made stiffer for prostatic passage, colon and rectal tubes, ice-coils for head and abdomen, and pure gum drainage tubing.

A fourth class of rubber goods may be made, which includes Esmarch bandages, for which there is now oftentimes a substitute in the shape of a rubber bandage, and a heavy rubber tubing is used for the same purpose with quite as much success.

There is very little to be said about catheters of various sorts. Almost any of those offered for sale are adequate for the purposes intended. Some of them are made out of better rubber than others, and consequently stand up under sterilization better, and they cost a little more than the poorer quality.

There is a good deal to be said about colon and rectal tubes. There is a diversity of opinion among medical men whether the high rectal tube and the colon tube always penetrate their full length, and we have seen many *x*-ray pictures taken of bismuth-lined colon tubes that seemed to pass with ease straight up the canal, but the picture showed they curled upon themselves. It is not an easy matter to determine just the proper stiffness desirable in a colon tube; if it is stiff enough to guide straight up the canal, it is oftentimes hard enough to actually perforate the intestinal wall, and this has been done. If it is soft enough for safety it is very much more than likely to curl on itself, and, after all, the introduction of a high rectal or colon tube is a matter of deftness and technic, rather than a question of the hardness or softness of the tube.

The cleaning of these tubes is another very important matter. Of course, every colon tube when withdrawn is alive with micro-organisms; some of these are pathogenic, and many of them are not so under any but exceptional conditions, but a colon tube might well be an agent for carrying an infection from one patient to another, and we have knowledge of a whole chain of colitis cases without any apparent reason, excepting the possible infection of the tubes used for the several patients. Generally speaking, there is no lack of effort on the part of nurses in the cleansing of their tubes. The question is wholly one of method. In some institutions the tubes are boiled after each using. In other institutions they are cleaned with hot water and soap, and are then soaked in 5 per cent. carbolic acid; elsewhere they are dipped in 1 : 1000 bichlorid solution after cleaning with hot soapsuds. We have at times investigated these various methods, and the laboratory has found too often that cultures could be grown from colon tubes that had been apparently well cleaned and dipped in 5 per cent. carbolic acid, and in a few instances cultures have been grown where the tubes had been dipped in the bichlorid, but there will be no cultures after the tube has been boiled, although boiling is hard on the tubes. An objection to boiling is the disintegration of the tube, and tubes of the very best rubber will not stand up for more than three or four boilings, and even before that time they become so soft that they are almost useless for the purposes intended. So far as we know, the only solution of the question is to replace the tubes as often as necessary and to boil them well as long as they last. The reason why the tube dipped in bichlorid or carbolic acid will sometimes make cultures is because occasionally the inside of the tube will catch a quantity of mucus from the intestinal canal, and this mucus in the presence of carbolic or bichlorid will oftentimes harden and encapsulate the micro-organism, and will act as a protecting shield against the invasion of the sterilizing fluid.

Of course, it goes without saying that all colon, rectal, and stomach-tubes must

be open at the end as well as at the sides, and that the end opening must be as large as the lumen of the tube itself, so that no secretion may gather in force.

Care of Rubber Tubing and Catheters.—The best way to keep these articles is in a thoroughly dry state, immersed in talcum powder. If they can be hung straight in long glass tubes, sealed at one end and well corked at the other, the form will be best preserved.

The purchase and care of rubber gloves are taken up in detail in the section on Operating-room Technic.

Purchase of Consumable Supplies

MEATS AND FISH

Whatever may be said about the ethics of an economic situation in this country that has permitted the control of the meat industry to fall into the hands of a few corporations, it must be admitted that some very wholesome results have followed in consequence of that control. When there were slaughter-houses operated by individual butchers on the outskirts of every village, town, and city there could be no control over the slaughter and preparation of meats as human food. Any adequate inspection was out of the question, unless, indeed, there were an inspector for every slaughter-house, whose duty it would be to inspect not only the meats after they were killed, but the meat animals on the hoof and the conditions for the care of the meat after it was killed. Those were the days of trichina in hogs and the insidious forms of ptomains in beef, mutton, and veal. Again, the meat industry has grown into so compact and gigantic an institution that the public has become aroused to a necessity for very strict regulations, to the end that national, state, and municipal inspectors are in control nowadays of the meat output, especially that part of it that has its home in Chicago's packing town, and this inspection sifts pretty thoroughly the good from the bad and indifferent stock importations to the slaughter-house district. Huge rendering plants that eventuate in soap-works have grown up about Packing Town for the utilization of diseased stock that formerly was sold as food.

Meat for institution use now comes either from the Chicago stock-yards under a sufficient protection to guarantee its wholesomeness, or from local slaughtering-houses, still maintained in a few places, but whose sanitation and hygienic conditions can be made a matter of personal inspection by the institution administration. The question of diseased meat, therefore, has become a negligible quantity, and in considering meat we need only contemplate the standards of those qualities above suspicion.

Beef is the most important meat that we have to buy, and it comes to us in one of three states—either fresh, that is, immediately after it has been killed, and before rigor mortis takes place, and before the animal heat has left it; chilled meat, or that which has been kept in cold storage above the freezing-point for hours or days, or even weeks, until withdrawn for use; and frozen meat, or that which has been frozen hard and kept so for varying lengths of time.

In the public campaigns that have followed occasional uprisings against packing-house methods a great deal has been learned about meats and their preparation. One of these things is that meat ought to be immediately chilled after it is killed to prevent either chemically fermentative changes or bacterial growths, and unless we have in the institution abundant facilities for chilling our own meats before bringing them to use, they ought not to be purchased fresh and unstiffened.

Freshly killed meat has a brown, smoky look about it, is soft and pulpy. If it is cooked at that stage it becomes tough and stringy, and is not regarded as a good meat from the epicurean standpoint, however nutritious it may be in contact with the digestive apparatus.

Frozen meat has a peculiarly marble-like appearance; the division lines between the fat and the lean are clear cut and distinct. The fat immediately next to the lean is very white, and the lean has that peculiarly handsome, bright-red appearance which we recognize as a good healthy meat color. The objection to frozen meat is that there are difficulties in the way of thawing it out and of cooking it. In tropical countries it is almost a dangerous thing to attempt to cook frozen meats, because it not infrequently happens that before the meat is put into the chilling rooms flies have been allowed to blow it, and it has become infected with bacteria, some of which are more or less poisonous in character; the freezing process makes it impossible for these bacteria to become active or to reproduce and thus to form toxins; when this frozen meat is put upon the fire, especially if it is put in a slow oven, as is many times done for the purpose of thawing it, the bacteria seem to spring into activity, and, even before the meat is thawed, it is sufficiently infected with bacteria and their toxic products to produce ptomain-poisoning. The only proper way to thaw frozen meat for cooking, and it is a poor way at best, is to thaw it out in cold water, and then to put it on the fire to cook in whatever way it is intended to be used, whether steak, roast, or boiled.

The best form of meat to be used is that which has been chilled and maintained at a temperature higher than the freezing-point. Chilled meat can be readily distinguished by those who are accustomed to handling it by the fact that the fat, especially that nearest to the lean, is pinkish in color, which indicates that the meat-juices have run across to the fatty tissues.

Diseased Meats.—Meats offered for sale in this country to-day are tolerably free from suspicion of disease, and, fortunately, most of these diseases can be readily detected, either before the animal is killed or without the aid of the microscope afterward. About the only beef disease worthy of consideration is tuberculosis, and this disease is usually expressed in the form of the so-called lumpy jaw, which is easily detected during the life of the animal, and is sufficient cause for condemnation by the inspectors, or in the form of enlarged and often purulent glands. The so-called "measles" in beef meat is due to the presence of a micro-organism known as the Tænia saginata, and this measles disease is very easily detected by making a fresh cut of meat at almost any point. The measles blotches are about the size of a pea, whitish in color; within their areas reside the parasites; this meat has harmful toxic properties.

Pork meat has two diseases—trichina, which unfortunately must be seen under the microscope, and the so-called Tænia solium. Trichinosis is a disease that seems to be very rapidly disappearing, and, indeed, confined to hogs fed on decomposing animal food or on fermented products, such as the distillery outputs; the Tænia solium can be detected in hog meat with the naked eye, and is identical in appearance with the "measles" of beef.

Sometimes mutton is affected with the so-called hydatid micro-organism, but it is so infrequent and so difficult to find that no amount of carefulness will protect mutton eaters against it. Occasionally also mutton is affected by the tetanus bacillus, but infrequently; and, without doubt, this micro-organism is a negligible quantity in discussing the merits of mutton for eating purposes.

The only precaution necessary in the purchase of veal is to be sure it is not too young. There are peculiar chemic constituents in the meat of all very young

animals that make it unfit for food, but the results of eating too young meat are usually not severer than diarrhea or some slight gastro-intestinal disturbance.

Choice of Healthy Meats.—There is no institution so small but what the greatest possible economy would be practised by the purchase of whole carcasses, and if it is a small institution, the expense of putting in an ice-box and the purchase of ice to cool it will be more than repaid in economic purchase of whole carcasses, from which selections may be made for various feeding purposes in the institution. Oftentimes when small cuts are bought at the corner butcher shop, meat that has cost 20 or 30 cents per pound will be used, where a piece costing only half as much might serve quite as good if not a better purpose; where one has a whole carcass to choose from, just the right meat for the purpose can be picked. Of course, institutions that have their own ice plant ought to keep a number of carcasses of various animals hanging all the time in a temperature a little above freezing, and then a very fine selection of cuts can be made for the various institution purposes.

It is not economy to buy heavy cuts of meat. Small animals with small bones, like the heifer or the young steer, or the small fat cow, is a much more economic form of meat than the big-boned ox with large deposits of fat. Old animals especially are uneconomic, because, if they are thin, the bone weighs too much, and if they are fat, there is too much waste in the chunks of fat unevenly distributed and not available for food. Bull meat, so often sold for that of the steer, and the character of which is detected by the stringiness of the lean and the absence of surface fat, is oftentimes an economic meat to buy for stews for the help or for soup meat. It is always much cheaper than ox or cow meat. There is no economy in buying large ribs, because the waste is very great both in bone and fat. "Second" ribs, that weigh an average of 35 pounds, and that cost 1 cent or even 2 cents a pound more than the "firsts," are cheaper than the "firsts," which weigh 60 or 75 pounds.

The only other animal in which there is much choice in the hung animal is the hog, and the same principles apply as in beef. The small young hog can be very much more advantageously used because of the smaller amount of fat and the smallness of the bone, and the smaller breeds of hogs are better for the same reason.

The Cutting of Meats.—It will be rather useless for us to go into the question of the cutting of meats, because that field is covered amply in the works on dietary and digestion, and we need concern ourselves at this point only with the economic phase of the question. There is more to the cutting of meat than the casual observer would believe, and a careful butcher, who thoroughly knows his business, and one especially who knows about the cooking of meats, can cut his pieces so that some of the very cheap parts can be made to masquerade as fine cuts; this is not a fraud, because oftentimes the cheaper cut of meat has the more nutrition in it; for instance, a sirloin is well known to have a higher nutritive value than a tenderloin, and yet the sirloin is the cheaper. There are many people who from choice select the round, especially the inside of the upper thigh, in preference to any other cut, and if the fiber bundles of a small round steak are divided either by a knife or chopper the steak can be made as tender and delicate as the finest cut taken elsewhere. There is an art in the cutting of meat, and one of the coarsest cuts of the animal, in the hands of an artistic butcher and an artistic steward, can be made to surpass in delicacy and flavor even the finest cuts in the hands of some one who does not know how to cut or prepare them, and, after all, what is called economy in the cutting of meats is nothing more nor less than the careful cutting of the coarser parts to make them appetizing, so that they will masquerade for choicer and more expensive cuts. Some extremely interesting studies on the subject of waste in

food animals have been made at the Chicago packing houses, when the saving of even an extra drop of blood from each animal slaughtered in the course of a year may run into hundreds of dollars. For instance, it has been found that in the average steer marketed there is 22 per cent. of bone which is of practically no value as food; while in the average cow there is 26 per cent. of useless bone, and in the calf only 16 to 18 per cent., according to the age of the animal. From these figures we may judge that the careful selection of meats may mean a great saving in the course of the year.

Poultry.—In the Michael Reese Hospital a study was made covering a long period of time concerning the waste in poultry. About 25 per cent. of poultry of all kinds—chickens, ducks, and turkeys—were found to be made up of waste products—heads, feet, feathers, and intestines. It was also found, however, that nearly 50 per cent. of this waste was made up of necks and feet that are usually thrown away; and of the gizzards, livers, and hearts, all of which are available with little trouble of cleaning, for making broths for special diet cases.

The Purchase of Fish.—Fish being a cold-blooded animal, the question of setting or ripening after the animal heat is gone does not obtain, and, without any doubt, the delicacy of fish as a food depends upon its freshness. There are many persons who find fish a delicious food when cooked over the camp-fire immediately after it is caught, and these same people dislike fish intensely as it is purchased on the market, no matter how much better it is cooked at home.

As we buy fish on the markets to-day we must understand that there are definite sources of supply, and we must take into account the long hauls in transit. For instance, nearly all the halibut that is used in this country comes from the Pacific coast, a little of it from outside Vancouver Island, but most of it from as far north as Alaska, especially about Baronoff Island; some of the halibut comes from about Newfoundland, especially that sold in the east. Halibut is usually caught by the natives, and thrown into the holds of the fish vessels and packed in ice, and in that way is transported to either Seattle or San Francisco on the Pacific, or New England towns on the Atlantic coast, and thence goes by land to the points of destination.

Fresh halibut and fresh cod come practically from the same neighborhoods, and are brought to market in the same way and in about the same length of time.

Fresh salmon is a vastly different fish from that caught and canned on the Pacific coast, as the "runs" go up the streams to spawn. The fresh salmon put on the market is not the spawning member of the family; it is a vastly superior fish.

The other fish, such as lake trout, white fish, red snapper, sea bass, and the like, all depend for their flavor, delicacy, and attractiveness on the shortness of time they have been out of the water.

Halibut is the most economic fish to buy—the head is cut off when it is caught, it has practically no intestines or fins, and its bones are confined to the spine, so there is no waste to speak of. In other fish there is a varying loss of weight in heads, tails, fins, and intestines, and this waste ought to be considered in the purchase.

The Purchase of Canned Fish.—In buying canned fish two considerations must always be uppermost: first, the character of the fish for packing purposes, and the medium of preservation. There are two kinds of fish packed—the acid fish, like Bismarck herring, packed in vinegar, and the oily fish, packed in their own oil, like salmon, or with other oils added, like sardines. Acid-packed fish are liable to be highly injurious, because the acid corrodes the tin of the can, forming a tin

salt; these fish are usually packed with a tin plate of a silvery color just under the head of the can and soldered to it; if the plate is separated from the head, the contents are quite likely to be dark colored and impregnated with the harmful tin salts. All acidy fish should be packed in enamel or glass cans. There is hardly any danger of this kind with oil-packed fish, and there is much added nutrition in the oils themselves.

Salmon is, of course, the stand-by in canned fish for institution purposes and an excellent article of food. Fortunately, salmon are packed in very few large canneries on the North Pacific coast under the eye of very watchful government inspectors. The labor at the canneries is usually Chinese, the cleanest labor to handle foods in the world; the methods of processing are not filthy at the worst, and under present-day government supervision the work is done in a systematically clean way. The price of salmon depends somewhat on the heaviness of the annual runs at the various sources of supply on the Northwestern coast rivers, and more on the variety of the fish, the so-called sockeye salmon, a small but very delicate variety, being easily first in desirability as it is highest in price. The Fraser and Columbia river varieties seem to have the next call, though they are identical with the Alaska and neighboring kinds; the cheapest is the dog salmon, a coarse-grained fish, usually covered with sores when caught as the result of fighting over the rocks and falls toward the spawning grounds. It is too bad the world markets are not better supplied with dried salmon, which makes a most delicious dish when creamed or stewed or made into cakes or balls, far superior in flavor to cod.

PURCHASE OF EGGS

Eggs are divided into a number of classifications, some of them commercial and some of them domestic. Of course, in the produce markets we have the various grades of eggs, such as strictly fresh, fresh firsts, seconds, dirties, and just eggs. These, however, are arbitrary classifications that are not sufficient for the purposes of the buyer, and these classifications may mean something or nothing, and generally fall very far short of telling the whole story about eggs.

Such a classification as this is better:

Fresh eggs, stale eggs, cold-storage eggs, incubator eggs, and unusable eggs.

It is not often that we can buy strictly fresh eggs, and when we do we must usually pay more for them than most institutions can afford; the exception to this rule is in the springtime, as for instance about May and June, when most of the hens in the country are laying, and when eggs are being bought up for the cold-storage people to save over for high prices next winter. Stale eggs are those that have not gone into the cold-storage warehouses, but have ceased to be strictly fresh. Generally speaking, these eggs have been washed, and the air has been allowed to permeate through the shell and to chemically decompose the yolk to such an extent that oxids and sulphids are allowed to form; the taste of stale eggs is due to sulphureted hydrogen. When eggs are first laid they are covered with a mucilaginous coat which perfectly excludes the air; this coating is an albuminous substance, easily soluble in water, and when the eggs are washed the coating is destroyed, and thus the air is enabled to penetrate. On inspection these eggs have a dead look about them, without any gloss whatever, and they are very deceptive, and do not admit of classification by means of the transillumination of candles. They appear under the candle process perfectly clear, and would be taken for strictly fresh eggs by the most acute inspector but for the air space which we shall see about later.

Incubator eggs are coming into evidence more every year. They are simply

an exaggerated or an aggravated stale egg. They make their appearance early in the spring, and are nearly always palmed off as strictly fresh eggs. These eggs have started on their career by being put into incubators for hatching purposes. The first eggs of the early spring, or last eggs of winter, are rarely very fertile, oftentimes not more than 40 or 50 per cent. being impregnated. They are placed in the incubator at 103° F., and are left there from three to five or more days. The beginning chick can be detected in a clear white egg on the third day of its incubation; in brown eggs, on the fifth day. When the incubator full of eggs is tested out, those that have not started to germinate are put aside and are sold as strictly fresh eggs; as a matter of fact, they have aged about as much as an egg would under ordinary circumstances in two or three months. There is no method by which these incubator eggs can be detected, excepting that when held up to the light it will be seen that a considerable air space has appeared in the large end of the egg, or, unless the incubation has been very carefully handled and the eggs turned frequently, this air space may appear on the side of the egg. A strictly fresh egg is one in which the shell is full of meat and in which there is no air space. The older the egg is the greater the air space will be, and the incubator egg will have all the outward appearances of being strictly fresh, but will have considerable air space.

Dirty eggs are not always bad eggs, and, if they can be bought directly from the farm or from the country grocer, they may be fresh. These eggs are dirtied in one of two or three ways—either the hens' nests are allowed to become foul, because the hens are allowed to roost upon them as well as lay in them, or they are the eggs of hens that have laid out in the weather and that have become wet, and then are allowed to dry in touch with the wet nest material, which stains them. In this latter case the soiling will have a sort of yellow, weathered look. In the former there will be particles of manure sticking to the egg. The class of these eggs can be easily judged by candling, and they are about the only eggs that can be detected by candling, except the strictly fresh.

The candling process of eggs is not only for the purpose of determining whether there is a chick inside, but to determine as well the age of the egg, measured by the amount of air space in the shell. It can be set down as a definite, unalterable fact that an egg that has a perfectly clear inside, without any spot, and that has no air space, is a strictly fresh egg, and that is the only egg that can be called so.

It goes without saying that we can very much better afford to pay more for eggs that are all good than we can for eggs that have a certain percentage that are bad or old. In some markets eggs are classified by percentages, all those about 80 per cent. being considered practically strictly fresh. If we ask the egg tester what 80 per cent. means, he will say that it means that 80 per cent. of the eggs are good and 20 per cent. of them are not good; that is not what the classification means at all, or at least it is not what the classification was intended to mean when it was established. The 80 per cent. means that there is 20 per cent. or less of deterioration in all the eggs.

It is a subject of almost mathematic calculation whether eggs can be fed to an institution economically or not. Most institutions have a definite, established meal for the working forces, the breakfast, because of its simplicity, being perhaps more amenable to exact calculation as to price rather than dinner or supper. If it takes fifty loaves of bread and 25 pounds of cereal, and one hundred oranges, and 7 pounds of coffee to make a breakfast for a given number of people, we can figure precisely what that breakfast is costing. Then, if we want to substitute bacon and eggs, we can determine just exactly how much money we can

afford for the bacon and eggs. If eggs, at 20 cents a dozen, will foot up, including the other articles of the meal, just what the breakfast would foot up with fruit substituted, we have a gauge by which to measure whether we can afford to feed eggs. It may be safely doubted whether it will ever be economic to feed boiled eggs to working help in an institution; eggs, while extremely nutritive, do not go very far toward forming bulk, or, as the stock raisers would say, "roughness," but bacon is not only a most nutritive food, but is a "filling" food, and holds one up a long time; so that eggs with bacon make a well rounded-out meal, and then if bread or toast or coffee cake and coffee are added, the people will nearly always be well satisfied. Poached eggs on toast are much more satisfying than boiled eggs, because of the bulk of the toast.

Roughly speaking, the best housekeepers are disposed to feel that eggs at 20 cents a dozen are cheap enough to feed to the common help at least two or three times a week. Eggs at 25 cents may be fed to the higher order of institution employees, such as the nurses and interns. When eggs get above that figure they should be kept for the patients.

The problem of buying eggs in large or small lots is not a very serious one in most parts of the country now. Nearly all institutions must buy their eggs from middlemen at best, and they can be had so frequently that it will hardly pay to lay in a large quantity. If one cares to watch the market closely enough, and has cold-storage room for a considerable quantity, quite a little saving can be made by gambling a little in the commodity; that is, by buying for a week ahead, if the eggs should happen to be "off" in price occasionally. The facilities of the cold-storage warehouses, however, pretty evenly take care of this angle of the business, and it is too often a fact that the cold-storage warehouse people are so much better gamblers than the institution buyers can possibly be that the latter will usually get the worst of any attempt to anticipate the market, so that in the course of a year's buying there will hardly be much saving from any attempt to keep posted on the ranges of the market in a commodity that lends itself so well to the machinations of the cold-storage experts.

THE PURCHASE OF BUTTER

Some of the ablest bacteriologists in the country have been devoting their time almost exclusively for some years to microscopic and chemic study of butter. They have not realized very much of value to those of us who must buy butter for daily consumption in an institution. It is not even certain as yet that pathogenic forms of bacteria, such as the colon, are harmful in butter, because a good many of the bacteriologists are of the opinion that, in the process of ripening by the activities of the so-called lactic acid bacteria, the colon and other pathogenic forms of micro-organisms are practically destroyed; in other words, that there is a period of acidity, or a degree of acidity, to which cream arrives in ripening which has the effect of destroying the pathogenic micro-organisms.

We may take up numerous publications from experiment stations in various states, or from the Agricultural Department of the Government, and we shall find there perfect mazes of figures, showing numbers and character of bacteria in butter at various ages after it has been made, and under varying conditions as to temperature, cleanliness, and character, but at the end of all these figures we are brought to a sudden realization of the fact that we can distinguish pretty nearly as much by the taste, aroma, rancidity, or freshness of the article as the scientist can by an intricate process of microscopic bookkeeping on the article; so that, for our purposes,

the proper purchase and character of butter—we shall be pretty safe in discarding, at least until the scientists have gone farther and fared better with their work, all other facts, excepting that there are three classes of butter which we shall meet with in our day's marketing—the first is the best quality of butter, made manifestly from clean, carefully ripened cream, churned under well-established principles of dairying, and which we can readily determine is good butter by the taste and smell. The second is a so-called "renovated butter," and which is made by taking miscellaneous allotments of farm-produced butter that has grown rancid, mixing it all together, washing it to take out the acids of rancidity, and drying it as carefully as can be done. The third is butterine, about which we have come to know a great deal by reason of the government's activities in the punishment of those who artificially color it. Butterine, as made by the large producers, consists of cotton-seed or palm oil and the leaf and kidney tallow of beef or mutton, with a certain proportion of neutral lard, the whole being churned with skimmed milk or buttermilk. If the milk is clean the product will be good and far wholesomer than bad butter.

For our purposes all these forms of butter have pretty well-defined characteristics which can be stated very clearly. The perfect butter is practically butter-fat and a certain residue of the constituents of milk, the amount of this latter depending on the character and thoroughness with which the butter has been washed and dried. Good, fresh butter contains several hundred million lactic acid bacteria per cubic centimeter, the pathogenic bacteria having been eliminated either by destruction at the hands of the lactic acid bacteria or the acid which these produce. The fat, of course, is a butter-fat which has a low melting-point, in every case lower than the temperature of the human body. Renovated butter differs from the above only in that it seems to contain a large number of pathogenic micro-organisms, but hardly ever a sufficiently large number to be objectionable. The ordinary processes of renovation of this butter—that is, the process of washing and cleaning—are not sufficiently complete. Take out all the acids of rancidity and the butter does not keep well, and the difference in taste between this butter and the best butter is due to the presence of a residue of these acids of rancidity. The butter-fat in renovated butter is quite the same as that in the best butter.

Butterine differs from the cow butters in two distinct particulars: first, it is churned with the cheapest milk, that is, milk that is ordinarily not clean, and from which none of the pathogenic organisms have been eliminated, excepting in the natural course of ripening in the predominance of the lactic acid bacteria; second, and most important, the beef or mutton fat which represents the butter-fat of the cow butters is a stearin whose melting-point is a good deal higher than the body temperature, that is, around 110° F.

Physiologically, any of these butters is perfectly digestible in the stomach of the healthy adult, that is, any person who can eat fat meat can eat and digest any of these butters. It goes without saying that butterine should not be fed either to children whose gastro-intestinal apparatus is not very strong or to sick people.

The chief reason why manufacturers insist on coloring butterine is to enhance the appearance of the manufactured article. We have become accustomed to a rich, yellow color in butter, and we do not willingly eat butter that is free from color. The fact of an artificial color is not objectionable in butter; it is merely a question of the harmfulness or otherwise of the particular coloring-matter employed. It has been said that there are certain manufacturers who color their product by feeding large quantities of carrots to the cows, which has the effect of giving a high color to the butter made from the cream from those cows, and then using a certain pro-

portion of this highly colored carrot butter in the making of the butterine. It has also been said that butterine is colored by the use of a small proportion of the yolk of eggs, the particles very finely divided and churned into the product. It is certain that neither the addition of carrot butter nor the yolk of eggs is harmful as an article of food. It seems that the objectionable feature of artificial coloring, from the standpoint of the government, is the use of coloring-matters that are supposed to be harmful in themselves.

When the bacteriologists have gone a good deal farther with their subject than they seem to have gone at the present time they will probably find that the digestibility of butter depends quite as much on the character of the cow which has furnished the butter-fat as upon any other items or conditions. We have gone far enough already to know that the butter-fat globule of the Jersey cow is several times larger than that from the Holstein-Friesian, and that the difference is sufficient to make or mar the health of a young calf. In other words, the keepers of Jersey herds oftentimes employ a Holstein-Friesian, or common cow, to raise high-bred Jersey calves, because the calf's own mother's milk contains a butter-fat globule too large to go into the circulation readily; whereas, the smaller fat globule goes through very readily. This is the reason why mothers' milk, the butter-fat globule of which is infinitesimal in size, is better for the young baby than cows' milk, and why asses' milk and goats' milk, which have likewise an infinitely small butter-fat globule, come next in the order of preference.

Butter keeps very well in cold storage; so well, indeed, that it seems almost unnecessary at any season of the year to lay in any considerable quantity. It is true that in the winter time and in the early spring, before the grass is visible, butter is usually much higher, but this is due only to the fact that the average farmer allows his cows to go so low in their milking when they are stable fed that they do not make very much butter, and consequently the cold-storage houses have almost a monopoly of the business.

THE PURCHASE OF FRESH FRUITS

Nearly all fresh fruits used in this country are home-grown. A few Spanish grapes are imported, and are used mostly in the eastern states; there are not enough of them, however, to supply the American market at a price that people will pay. A great many lemons are imported from Spain, Italy, and the Mediterranean country, but they come at a time when California lemons are extremely scarce and not very good; a good many oranges are grown in Porto Rico and brought to this country by way of New Orleans and the Florida ports, but the Porto Rico importations hardly figure in the orange market because of their comparatively small number. Cuban oranges, so far as the United States is concerned, have practically disappeared from the market; importers say that they do not keep, and even in the short hauls from Cuba to New Orleans, or from Cuba to the Atlantic seaboard, they speck badly and are rendered unfit for market. California supplies practically all the tropical fruits used, excepting pineapples and bananas, which come from the far south. Fortunately, the variations in temperature and climate generally of California, and the variations in the methods of fruit production of that state under irrigation systems, permit very long seasons. Lemons and oranges are both ripened practically throughout the year, and a tree may have blossoms and ripe fruit at the same time. In the northern part of the state oranges ripen later than in the south; the trees bear longer in the south, but those raised in the high altitudes of the south and those raised in the north of California and

in Oregon and Washington are noted for a better flavor than those distinctly southern, and also for a firmer meat.

California fruits are growing higher in price every year, and this promises to be still more marked as the state's fruit industry becomes organized into something that is already very closely approaching a giant trust; indeed, we have to thank California to-day for the fact that the duty on lemons imported from the Mediterranean orchards is 50 cents higher than it was before the late tariff law went into effect. Previously the duty was 70 cents per box. It is now $1.18. This increase in duty hardly helps California any and does a great injustice to the rest of the country, because we do not use Mediterranean lemons when there are any to be had from California. As we have said before, the lemon orchards of California are constantly producing, but in the late spring and summer the production is very low, not enough for consumption even on the Pacific coast. Lemons, of course, are in greater demand in the summer time, when California has few to sell.

Neither lemons nor oranges nor grapefruit will bear cold storage. The citrous fruits cannot be cold stored at all, because they speck at once and go to pieces.

California oranges are in the market practically all the time, because of the length of time that the trees bear and the difference in the time of the commencing harvest, owing to the differences in temperature and climate.

Apples and pears can be accounted as perhaps the most reliable fruits that institutions can count upon. Both of these fruits can be kept in cold storage over almost any length of time. We are coming to rely for our apples and pears, and especially for the apples, upon the irrigated lands of the Pacific coast—Oregon, Washington, and the extreme northern part of California. Of course, in good years we get many fine apples from the Atlantic seaboard, New York State, and the New England States, Canada, Michigan, and a few other points of the lake regions, and of late years Arkansas and the Ozark Hills of Missouri are coming into prominence as apple-growing sections.

The prices of all of these fruits are fixed, not so much nowadays by the supply as by the artificial means of the middlemen who buy and hold them. Of course, the fruitgrowers' associations of California are very nearly fixing the prices of California fruits, limited only by the willingness of people to buy the fruits and by the malign influence of railway dictation. The price of those fruits that can be cold stored—apples and pears—are fixed practically by the cold-storage warehouses, and the prices are practically what people will pay, as evidenced by good times and the amount of money the public can afford to spend. All these conditions in all these fruits bear upon hospitals, hotels, sanitariums, and other institutions. We must take our chances with the rest, and simply have to pay the prices demanded. Sometimes we can help ourselves a little by purchasing in considerable quantities on a low market, but only to the extent of a few boxes, and not enough to last over any considerable period of time.

Just a word about the economic handling of fruit in institutions. Of course, it makes very little difference what size lemon we use, and all the difference in the world how much juice the lemon contains. There are lemons that are practically dry and that have a fine outward appearance, whereas there are poor looking, thin-skinned, small and rather dried-up looking lemons that are full of juice, but the fact that they are of poor appearance does not make them any cheaper when we go to buy; while, on the other hand, the lemon of fine appearance is regulated as to price by its appearance and not by its real value.

Grapes are, of course, luxuries, and are purchased as luxuries, and people buy them quite as much for their inviting appearance as they do for their taste.

There are as many qualities of oranges as there are sections in which oranges are grown. Beginning with the large, magnificent looking naval oranges, of southern California, and ending with the little, reddish, thin-skinned oranges of Cuba and Porto Rico, we have every variation in size, look, taste, and juiciness. The largest and finest looking oranges are not the best for eating purposes, and they are not always the best for an institution to buy, even when the price is right, and this brings us to a question of the serving of fruit economically. A box of oranges is a box of oranges, everywhere, as to price and irrespective of size. In the large sizes the boxes contain fewer oranges, of course, and those who buy them do so much more for their appearance than for their real value. When institutions buy oranges they do so for the purpose of feeding them to patients, nurses, interns, and other hospital people. There are oranges that run as low as 70 to the box, and there are boxes that run as high as 300. Good caterers—that is, from the standpoint of economy of service—are about agreed that oranges that run about 210 to the box are the proper size to buy if it is intended to give a whole orange to each serving, while at 150 to the box the oranges may be cut and served one-half to a helping, thus giving about 300 helpings to the box in that case.

Large apples have no value over medium-sized ones from any standpoint. The immense, beautiful fruit of Oregon and Washington is not a very well-flavored fruit, and it is popular largely for its magnificent appearance; when apples are served they must be served whole, one to each person, and while some institutions, hotels, and hospitals with private accommodations often serve these beautiful, big apples to their favored patrons, they do so on appearance alone, whereas if a really serviceable and delicious apple is desired it can be best had in the medium size, and especially the fruit grown in temperate climates of the East and North.

We are dependent for our pears on the California product, and these can be cold stored for as long a period as two years or even longer without deterioration. Peaches must be used as they ripen, because they do not keep. The California product is the handsomest in appearance, the highest in price, and the poorest in flavor. New Jersey and Maryland used to be the most reliable source of supply, with Michigan second. Of recent years the South, especially Georgia, Texas, and the Ozarks of southern Missouri, have come to the front in peach production, and now supply a large part of the market. Most of the plums come from California, Oregon, and Washington.

Peaches and plums have an extremely limited use for institution purposes, and can be served only raw and whole, either as the beginning of breakfast or at the end of supper. Apple and pears can be served in an infinite variety of ways at almost any meal and for any part of the meal, either raw or cooked. For the sick, baked apples or pears are delicious, wholesome, and nutritious. They very frequently answer the question "What can we serve for dessert? and their popularity is enhanced by the fact that they are to be had at all seasons of the year and kept in the institution cold rooms indefinitely.

PURCHASE AND CARE OF ROOT VEGETABLES

The root vegetables include potatoes, white and sweet, the roots of the turnip family—*i. e.*, beets, rutabagas, and turnips proper, and the long roots—parsnips, carrots, and salsify, or the so-called "oyster-plant."

There is no secret about keeping these root vegetables; all that is needed is that they shall be kept cold and dry. On the farm, parsnips, carrots, and salsify are oftentimes left in the ground over winter, and are gathered with an axe by cutting

frozen chunks of earth, including the vegetables. They are thawed out in cold water and are not in any way hurt by the freezing. Sweet potatoes may be also frozen, and if used immediately after thawing in cold water they will have lost none of their value.

The trouble with these root vegetables for institution use is that they can never be kept in a cold, even temperature, and any of them will be immediately destroyed if allowed to freeze and thaw alternately. That is the reason why they keep so much better for the farmer in deep, dry, cool cellars. If the institution has such a place in which to store its root vegetables, large quantities of them can be laid in very late in the fall and kept well until the growing season in the spring. If the institution has not such a place to keep them it will be vastly better to buy a sufficient quantity of each or any of them to last a week or ten days. It will be useless to attempt to keep them longer than this if they are bought in the winter time, because they will have come from the cold-storage warehouses, and we shall enlarge somewhat in another place on the reasons why foodstuffs cannot be taken from cold storage with the expectation that they will keep any considerable length of time in any other environment.

Properly cared for, almost any of the root vegetables keep very nicely piled up either in a dry, cool cellar, or, on the farm, in pits dug in the ground and covered in layers of straw beneath heaped-up earth.

If sweet potatoes or yams are to be kept they must be gathered very carefully without bruising, and they should be stored so that the individuals will not touch each other. If they are wrapped in paper—which is not nearly so difficult a task as it seems—they will keep better than in any other way, especially if they are laid up on a shelf, and if they are wrapped the potatoes can be laid close together.

The purchase of these root vegetables is not a matter that requires very much technical knowledge, excepting in the case of white or Irish potatoes. Potatoes form a very large item of hospital food. In fact, it has been pretty carefully calculated that the average institution will consume about one bushel of potatoes per day per 100 individuals, and the price of potatoes varies all the way from 50 cents per bushel, in the fall or late summer, to $2 per bushel in the springtime before the new crop comes in.

Cold storage has very materially lessened the difference between these two prices, and it is rare that spring potatoes cost more than 85 cents a bushel, and almost every year the institution manager is confronted late in the fall by the question whether he shall lay in a sufficient supply of potatoes to last over winter, or whether he shall buy from day to day, or week to week, trusting that the price will not vary very much. There is a fairly good basis from which deductions may be made as to the probable price of potatoes in the spring as against that of the fall. If the potato crop of the summer has been good, or even of average size, we have been paying about 50 or 55 cents per bushel, in large quantities, at the time when they may be bought for storage. The storage warehouses charge an average of about 1¾ cents per bushel per month for storage. If we purchase our supply in October and use out of the supply until May, that is, six months, we must figure that we shall have to pay storage for an average of three months, or in the neighborhood of about 5 cents, making the potatoes cost us 60 cents if we have paid 55 cents originally. The loss by rotting is quite a large item, and may be figured conservatively at 20 per cent., taking the whole supply together. This will add another 10 or 12 cents per bushel to the price, making it 70 or 72 cents. There are very few institutions that are so close to a storage warehouse that they can be delivered without cartage charges, and as we cannot keep potatoes fresh from cold storage longer

than a week or ten days at most, this means that we will have to pay cartage charges for potatoes in quite small quantities, and this will make another considerable addition in the cost, the amount of which can hardly be figured, because it hangs upon the distance from the warehouse and the price of hauling; so it may be readily seen that our potatoes will have cost us a good deal more by the time we use them than that represented in the original expenditure. If we attempt to keep them in the institution storage rooms, unless these are exceptionally deep cellars and exceptionally dry, the loss by rotting will be so great as to be practically prohibitive.

Taking the foregoing suggestions into account, the institution administrator will be able to judge whether or not it will be best to take the chance of an increase in the price of potatoes in the open market, and buy as he needs them, or whether he shall lay in a supply sufficient to answer for the winter.

However, if it is determined to buy a large quantity of potatoes to last until the new crop comes in, there are some technical points about the purchase of potatoes, quite well understood by the farmer and by the commission merchant and the purchasers for cold-storage warehouses, that may not come amiss. In the first place, root vegetables should never be taken out of the ground before they are thoroughly ripened with the expectation of keeping them for any length of time; just as an apple picked green will be the first to rot, so a potato, turnip, or carrot, gathered before it is thoroughly developed and ripened, will begin almost immediately to soften and then to decay. There is a way to tell when the potato is ripe; there is a way to tell pretty definitely whether the potato has been dug green or allowed to ripen in the ground. Just under the peel of the potato there is ordinarily a cortex of very definite thickness and a very clear outline that represents whatever protein there is in the vegetable, the balance of the potato being almost pure starch. If the potato has been picked before it was ripe this protein layer will not have formed definitely, and there will be almost no line of demarkation between it and the starchy portion of the vegetable, and, if there is not a clear outline and a very decided demarkation, it is certain that the vegetable will not keep and was gathered green.

The next point about potatoes, on which will depend their keeping qualities, is that of the soil in which they were raised, and this point must of necessity be a matter of honor with the seller. Those of us who pay a great deal of attention to the careful buying of food supplies are accustomed to buy northern potatoes or those raised in the far West, preferably in Colorado. Potatoes raised in Iowa or Wisconsin or those raised in the New England States will keep very much better, everything else being considered, than any other potatoes, excepting those raised in the sandy, irrigated desert lands of Colorado, Montana, western Kansas, and the northern parts of Nebraska. Sandy-soil potatoes keep better than those raised in bottom-lands.

After all is said about the buying of these vegetables, however, it must be frankly admitted that the food commission business, acting jointly with the cold-storage warehouse industry, has been able to dominate the situation in almost every commodity, until it is almost as much of a gamble, whether we buy in large or small quantities, as it is when we go into the pit and buy future wheat.

PURCHASE OF CANNED VEGETABLES

There is almost as much difference in canned vegetables as there is in human nature, and this is caused to a great extent by the fact that some vegetables, the finest kind, are canned almost in the field where they grow, and are put up fresh and

firm; the vegetable which has to be carted miles to a factory and jolted and bruised will not compare in flavor with goods handled fresh. Most packers of vegetables put up two or more grades.

Brands of canned goods are often misleading; one packer's standards may not measure up to another's; this is because there is no authorized grading. For some years the government has been trying to find some scheme of uniform classification, so that a standard brand would mean the same wherever found and by whomever packed; but the attempt has not been successful up to the present time. Even a standard of one packer this year may not be the same next year, owing mostly to the difference in the character and cost of the raw fruit or vegetable in different years; therefore, the only way to buy either fruit or vegetables is to see the samples, side by side, with the cost sheets at hand. Then it does not require an expert to buy—the eye and taste of a hospital steward and a glance at the comparative figures are enough.

Preparation is a very important part in the art of canning, as, for instance, in an article like string beans, where a packer is careless, and does not sort his beans as to size, and does not take care to see that the strings are removed, he will produce goods known as "seconds." If the grit is not removed from spinach as well as the hard stems, and if there are nubbin ends in the corn and an occasional dark-colored grain, and if some of the core is left in the tomato, the vegetable may be ever so good on the whole, but cannot be sold as first class.

Corn and tomatoes are, of course, the staple canned vegetables; both are bought most economically in gallons, though it is always well to have a few cases of small cans on hand to open for an emergency. The chief virtue in tomatoes is that they shall be uniformly ripe, and that there shall be plenty of sound, solid meat and not much juice; water can be purchased at less than tomato prices.

There is as much difference in canned corn as there is in corn served on the cob; field corn can never be as delicately flavored and as fine grained as the so-called sweet corns, whether in the can or on the cob. Attempts are often made by packers to disguise this difference, either by splitting the grains of coarse corn or by cooking it until it is soft. In the one case the small pieces of a large, coarse grain can be readily seen with the eye, and in the other the whole can will be a mushy mess, and even a blind man can distinguish between the two by the taste. Field corn will do very well for the help and is greatly relished, and it will do nicely for cream soups, when properly strained, and makes a most appetizing dish when made into a pudding, with eggs and a little sugar. The very finest grades of sweet corn are not to be found in gallon cans.

Canned string beans are not very satisfactory if wanted for a staple to feed to the well people; the fine grades of small, tender stringless beans cost too much for common use, and the larger coarser kinds are not pleasant eating, because it is extremely difficult to get the strings out on a commercial scale.

Peas are almost as staple as corn and tomatoes; they may be had in gallons or 2½-pound cans, any brand, quality, and size, excepting the so-called French peas, which come only in the small tins. Although peas are not a very regular or reliable crop, they keep well, and can be laid in to last more than one year if desired. Peas are usually graded according to size; the smallest are the youngest and most delicate and cost the most. French peas are merely half-grown ones, picked and packed with those peculiarly French artistic touches that make for attractiveness in appearance and delicacy of flavor, both being expressed in something like double price. The American packed French peas were colored with copper preparations until the pure food law; they are now very pure,

very wholesome, and very desirable as a change from potatoes, corn, and tomatoes.

Spinach is another vegetable that is a very welcome addition to the ménu. Packers seem to have some secret for washing it free of grit, and the canned variety cannot be distinguished from fresh, excepting it is smoother and cleaner; moreover, spinach is a vegetable that requires much work in preparation, stemming and washing, and it may very fairly be doubted whether, even in the early spring, when all nature craves green things, it pays to buy fresh spinach. It comes best in gallons.

Young beets put up nicely and make an attractive vegetable. They must be very small and tender, and are served best with a butter sauce. They are not cheap, and cannot be fed to the well people of the institution on that account. Packers seem to retain the custom of coloring them with cochineal, which gives them an exaggerated bright red appearance. There is not much to them, but they sometimes stimulate a lazy appetite, especially if served cold as a salad.

Asparagus is a vegetable about which there are many opinions. The fresh article in the spring is a universal favorite, and there are very few people who are not fond of it. It is canned in two general forms, the green made of the stalk that has been above the ground for two or three days, and the white, which is cut below the surface before it breaks through the crust of the soil, and there are two general forms of each of these again; green tips are the tenderest tidbits, cut an inch or two long, and cost more than any other domestic form; then there is the long green stalk, including the tips, in which there is some waste in eating, because only the upper third is tender enough to eat.

The white varieties are branded according to the four forms of packing—first, the short, heavy white stalks, including tips, that are packed either peeled or unpeeled; second, the long slender kind, also packed either peeled or unpeeled. Not nearly so much care is taken in this country about the details of packing as in Europe. The factories in Europe are at the fields, and the goods are peeled, boiled, and sealed immediately after being cut. It is certain that neither the California nor eastern American packed goods are as delicate of flavor as the best grades of European goods. The size and length of stalk of asparagus is a matter of a good deal of importance in serving. It makes no difference how large around an asparagus stalk is, people will not be satisfied with a service of three pieces. Cans of the short Mammoth White contain only about fifteen stalks, and will serve only three or, at most, four people, while cans of the long slender kind contain twenty-five to twenty-six pieces, and will easily serve five and often six persons; this fact must be considered in buying. The test of success in the packing of a fruit or vegetable is the nearness in flavor and appearance to that of the fresh article; nowhere is this more true than with asparagus. It is easy to preserve the firm form and fresh color, but the taste is another thing, and a standard of this year cannot be taken as a standard of next. The only way to buy asparagus is to see and taste the samples.

There is a very cheap form of asparagus, put up either in small tins or gallons, for making soups. It is composed of tough stalks left over after the tips are cut for a better grade and cut into inch pieces. The taste for soups is excellent, and the price brings this grade within reach of any institution.

There are other vegetables put up in cans, such as okra, Brussel sprouts, cauliflower heads, and so on, but these are considered luxuries, and are not necessary to the conduct of an institution kitchen unless there is a very high-class, exacting private clientele, when it may be desirable to keep a small quantity on hand in the smallest cans to be obtained.

PURCHASE OF CANNED FRUITS

In determining the value of canned goods, there are two very essential requisites. The first thing to determine is what grade of goods is wanted for the purpose. If the finest grade is desired, the two elements to be considered are the quality of the fruit itself, as to soundness and uniformity in size, and the character of the syrup in which it is preserved; the syrup is usually made from the juice of the fruits and pure granulated sugar. The next point to consider is the size of the fruit for serving purposes, as, for instance, a 2½-pound can of peaches, which counts from ten to twelve pieces in the can, will make six nice portions. The same fruit exactly, but of a larger size, may appeal more to the eye, but from an economic standpoint will not serve as many people, although the price is the same. A can of twelve pieces will make six full portions, while a can of larger fruit, and containing only seven or eight pieces, will only serve three and one-half portions, and it is human nature for one to judge, at least in a measure, by the quantity he receives, and two pieces certainly seem more to the average person than one piece.

In judging the quality of California fruits, and much of our fruit comes from there, it is necessary to consider the section from which they come; it is a well-known fact that goods from the northern part of the state are much more desirable and of a better flavor than those from the south.

The keeping quality of canned fruits is also essential; the fruits which are preserved without the pits, such as peaches, pears, and apricots, will keep almost indefinitely, and the length of time they are in the can matters little. Fruits which are canned with the pits, such as plums, cherries, and grapes, do not keep well, as there seems to be a germ in the pit which is not killed in processing, and which, after a certain time, begins to show life and causes fermentation to set in, which means swelled cans. It is best, therefore, not to buy these fruits in very large quantities.

California fruits, as a whole, are much prettier to look at than those grown in the East, but the conditions under which they are raised—that is, by irrigation—mar the flavor. Eastern fruits are not nearly as luscious to look at, and, therefore, do not always please the buyer or user, but the flavor is much finer and more delicate, on account of their being grown under normal, natural conditions.

Peaches, pears, and apricots are the chief canned fruits to be depended on for institution use in dessert form. Apples, especially the so-called "pie-apples," are excellent for stewing and for pies, and they can be prepared for pies so that they cannot be distinguished from fresh apples, especially the better brands which have a small amount of juice.

It pays to buy all canned fruits in gallon sizes, excepting perhaps a small amount of the very best grades, a 2½-pound can of which is convenient to open for a few patients or guests in emergency. The cost of the gallon is lessened by the fact that 1-gallon cans cost much less than four 2½-pound cans; the gallons, moreover, require less handling in processing, and the labor bills will be less for the buyer to pay. Of course in a small institution, where a whole gallon is not to be used at one time, it is more profitable to buy the 2½-pound cans, because, even with good refrigerators, there is likely to be some waste in the portions left over even if the "Jack Horners" are not about.

Some caterers like to have a few small cans of berries on the shelves to tempt the appetites of patients who must be given a frequent change. Some years the berries are cheap enough, even to serve to the nurses and interns occasionally, and may then be bought in gallons.

The Purchase of Olives.—Up to a few years ago only the Spanish olive was used in this country, and there were two sorts—the queen, or large olive, and the Manzanilla, or small olive. The queen is not nearly so abundant as the smaller variety, and has always sold for a larger price. In this country, where the people "eat so much with their eyes," as the French say, the queen olive has always been more popular, not because of its innate superiority, but on account of its more attractive appearance; and Europeans, with their proverbially frugal habits, have seemed perfectly willing to let their American cousins have what they themselves do not care to pay for. In the best cafes in Europe the Manzanilla olive is served as a matter of course, and it is the better olive as to delicacy of flavor, and it contains more actual oil, which is the only food value of the article.

Within the past few years California has made wonderful progress in the olive industry, and the "product of the golden west" has come to be in this country an article of actual food, because of its nutrient value, while the Spanish olive, either the queen or Manzanilla, is merely a condiment.

Imported Canned Goods Generally.—The day has gone by when the epicure or caterer must look to any country but the United States for palatable goods in cans, because the great moral wave that has recently passed over this country, supported by the pure food laws, has compelled packers to put up their goods without adulterants or coloring matter; while most European goods, especially those made in France and Belgium, have sulphate of copper added as a coloring matter and preservative. There are now only a few specialties, such as Russian caviar and the French long, slender-peeled white asparagus, that have any actual value over the domestic product. Even in the sardine industry American packers are using quite as good oil as the foreigners, and consequently the sardines are quite as good, and the tariff on imports has made at least a little difference in price in favor of the American commodity.

THE PURCHASE OF COFFEE

There are a few staple articles for the table that are common to all classes of society in every land, whether it be the Maharajah in his Oriental palace, the millionaire in his club, or the pauper in his hovel, and coffee is one of them.

Without any positive food value, and depending for its place in society on its stimulant, sedative, and more or less sentimental nature, coffee has one rival only—tea. It has no place whatever in an institution maintained for the care of the sick; it is never beneficial to the sick, and often positively hurtful; it cannot be good for nurses and interns, because the young do not need artificial stimulation of their physiologic functions; and the common help need nourishing foods to enable them to do their work, and not stimulants that presently produce a lethargy too often present without any external aid. And yet coffee has come to be one of the prime necessities in institutional life. And we must accept it and try to use it properly.

Coffees have been comparatively cheap of recent years until about five years ago, and it was said that coffee growers were not making a living. Brazil had, in the past twenty years, encouraged the growing of coffee to such an extent that in the year 1906 that country alone raised in one year enough coffee to supply the entire world for two years. It was necessary at the time of this enormous production for the Brazilian national government to find means for the protection of its coffee planters, and to try and maintain a fair market price for their product, and they passed what was known as the "Valorization Law," for the purpose of

raising money to buy and take off the market whatever coffee was not needed for immediate consumption.

To effectively accomplish their purpose and make it possible to market the surplus in future years, it was necessary to find a means of curtailing production and reduce the succeeding crops; and they passed laws, one prohibited the cultivation of any new acreage in coffee, another taxed the replanting of an old acreage so heavily that it was made prohibitive. The effect of these laws is now being felt—production has decreased until it is now less than the amount required for consumption. Brazil has been supplying four-fifths of all the coffees consumed, and, with the change in its product, all other varieties of coffee have acted in sympathy, and there has been a general advance in price.

With Brazil in the healthy condition that she is to-day, and with its strong financial position, and the backing which it has from the greatest financial syndicate ever known, it is not reasonable to suppose that there will be any action to cheapen the price of its principal industry—coffee. The trade is given to understand publicly and privately that it is the purpose to continue the control of production and the market price by legislation, the use of money, and the valorization scheme, and, in the opinion of the most conservative, higher prices have come to stay, and future selling prices will have to be advanced.

On the island of Porto Rico, U. S. A., is produced a very limited amount of coffee; it is of stylish washed character, with an attractive yellowish center, has a rich oily flavor, is moderately acid, and of good strength. The American people have not as yet been educated to its use, and nearly the entire production is sold to Europe at higher prices than the American trade will pay.

The Philippine Islands raise some coffee, but very little is exported. The Hawaiian Islands also have their limited production.

The Dutch East India Islands have for many years exported what is generally conceded to be the finest coffee in the world. They also produce some less desirable. Mexico has an important place in coffee growing, and raises some of the finest as well as the poorest; the poorer grades are grown more or less wild by the Indians, while the better ones have careful cultivation.

South America produces over 90 per cent. of all the coffees consumed. Venezuela has her Maracaibo, United States of Columbia her Bogotas, and nearly all the other tropical countries are coffee producers.

Brazil is the greatest coffee-growing country in the world, Sao Paulo being her principal growing state. The best-known varieties from Brazil are Santos, Rio, Victoria, Bahia, and Minas. These varieties have their distinct characteristics and an individuality of flavor. About 75 per cent. of the millions of pounds of coffee consumed in the world comes from the state of Sao Paulo. The growing of coffee is the principal industry, and the name is taken from the city of Santos, through which port nearly all of the Santos coffees are exported. While Sao Paulo coffees take the name of Santos there are a great many different types, grades, and qualities. The three principal classes are Santos, Bourbon Santos, and Santos Peaberry. The regular Santos has a smoother and more attractive bean than the Bourbon, which is more or less irregular and curly; the Peaberry is the male bean and round; the soil in the state of Sao Paulo and its climate are particularly well adapted for coffee growing. The wonderful cultivation of Santos coffee has in recent years advanced so rapidly, and the quality has so improved, that it has displaced other varieties of higher cost, and has even been shipped into Sumatra Island, the home of the finest so-called Javas.

It has been stated on authority that in the past ten years the average price of

coffees imported by the United States has been about 10 cents per pound roasted; this statement, in a sense, has created a wrong impression; there is a great quantity of the poorer grades of coffee sold; one local market requires one grade of coffee while another will take a different grade and type. This 10-cent average does not represent the price demanded for the finer quality, and is only a general average estimate, including the undesirable. The import cost for the more satisfactory grades is from 14 to 28 cents for roasted coffee.

Coffee Substitutes.—For some time the consumption of coffee has increased steadily every year. Its popularity has encouraged production to the extent of overproduction. Enterprises have been promoted with success to sell coffee substitutes at the expense of the genuine. The latest novelty is doctoring the coffee bean to make it more or less artificial by extracting the caffein; the active principle of coffee is caffein, which is the stimulating ingredient; this is extracted from the coffee beans and is sold at a high price on account of its highly medicinal properties. Nature has intended that caffein shall be in coffee, and when it is extracted it leaves a tasteless product without anything to recommend it.

In years past coffee substitutes were used more or less to cheapen the price of genuine coffee, and in so doing there were dealers who sold the mixed product as pure coffee and deceived their customers. These abuses have been regulated by the National Pure Food Law, and if any products are now mixed with the genuine coffee bean the package must be labeled according to the contents.

Chicory has been used more or less to mix with coffee, and the Germans, in particular, prefer a pinch of chicory mixed with even the very finest of coffee; chicory has a syrupy flavor which is very agreeable and thickens a coffee considerably. When it is used the ruling of the Pure Food Commissioner is that the package must be marked with the proportion of coffee and chicory which it contains. Peanuts, chicory, steam-cooked peas, breadstuffs, and roasted cereals have been in time past the principal substitutes for coffee—they have been used in different ways to deceive consumers. This condition has now been eliminated; there used to be a combination sold which contained chicory, peas, and coffee, and was known to the trade as "crushed Java." It was sold in a broken condition, and the peas and chicory mixed looked very well with the coffee; when this combination is now sold it must be branded "Coffee Compound—Coffee, Chicory, and Peas."

The question of what price an institution must pay for coffee to obtain a satisfactory article depends on a good deal besides the grade of the coffee itself. About one-half the value of coffee is in the making—a poor quality of coffee at, say, 18 or 20 cents, but well made, will be far better than a 40-cent coffee made badly.

Purchase of Cooking and Kitchen Utensils

It is difficult to persuade the average chef or cook to change from the particular kind of kitchen ware he or she has been accustomed to use, and, in the absence of actual figures to prove the value of one kind or style or metal over another, an obviously impossible thing to obtain, no dissertation on the subject will go very far toward changing the opinion of the culinary experts.

But there are some well-known advantages and disadvantages in favor of and against all kinds of kitchen ware.

Granite Ware.—Thirty years ago, when the Niedringhaus Brothers of St. Louis, Missouri, began to make their famous "granite ware" it at once took a prominence that defied competition, somewhat after the fashion of aluminum ware of a score of years later, and the patentees of the process became enormously wealthy. The

ware was made on honor, so to speak, and its lasting quality was so much greater than that of anything else there was no comparison. But when the patents expired every maker of kitchen utensils began making "granite ware" and the competition grew so keen that the quality suffered immensely. A piece of the original granite ware could be dropped on a stone floor without chipping, and the glazed covering of the steel material remained intact almost indefinitely, so that there was no possibility of rust and erosion. But with the quality made to-day it is different; if an article drops, there is a dent and a chip of glaze, and even the use of the stirring spoon soon wears the glaze off the inside. About the only thing in favor of the granite wear of to-day is that it is cheaper than most other kinds as to first cost.

Enamel Ware.—Enamel was the logical successor of granite, and, when the latter came into disrepute, smart manufacturers turned to the former; that, too, has now become so completely the victim of competition that its virtues are all but gone. Its value over granite lies in its whiteness and cleanliness so long as it is new; but it soon chips and discolors, especially on the bottom, and for that reason is not very popular. There is an enamel ware made in Austria that is far better than any made in this country. It comes, not only in kitchen utensils, but in almost every conceivable form—toilet sets, hospital vessels, and table dishes. It costs more than the American made goods and is well worth the difference.

Tinned Steel.—The cheapest of all kitchen utensils, and the most common, are made of steel covered with one or more coats of tin. As long as the tin remains the utensils do not corrode or rust, and articles can be retinned any number of times advantageously and rather cheaply unless they have to be sent a long distance to the repair shop. There is no way of telling how heavily the steel is coated, and one must trust the manufacturer. Thin-coated stuff is not worth buying, and it is impossible to use the ware after the tin is worn off, because the iron begins to corrode at once and to color anything cooked in it.

Copper Ware.—Many cooks prefer copper utensils, either bare or tinned. Copper is not altogether free from danger; certain vegetable acids, alkalis, and cleansing solutions and powders will act on copper, and, unless the vessels are very carefully cleaned before using, soluble poisonous chemic compounds are liable to be present in the food. Copper will last longer than any form of iron or steel ware, and, if properly handled, there can be no objection to it. Tomato juice, so harmful to agate, granite, enamel, and tin, has no effect on copper.

Aluminum Ware.—Aluminum cooking utensils, while having some disadvantages, have proved themselves the most satisfactory of all cooking ware for institution use.

Their disadvantages are usually due to imperfection in manufacture and to impurities or alloys in the metal used. Aluminum being a comparatively new metal, its characteristics and properties are not thoroughly understood by manufacturers, consequently aluminum utensils are not always satisfactory. Its great advantages, however, outweigh any disadvantages, owing to the fact that aluminum is pure and safe, no retinning is required, and there is absolutely no danger of any formation of verdigris, food discoloration, food contamination, or metal poisoning.

Few fruit or vegetable acids which occur in ordinary cooking have any effect on aluminum. Some acids do act on the metal, however; it is dissolved by hydrochloric or muriatic acid, and sulphuric and nitric acid act on it slightly; it is corroded by solutions of caustic alkali. Some alkaline waters discolor the metal, but this discoloration is harmless, can be easily removed by any good scouring material, and has no injurious effect upon the kettle unless the discoloration amounts to a

corrosion, or the discoloration takes place so frequently as to wear out the utensil in scouring. Aluminum utensils should be made of sheet metal rather than of cast; the metal should be pure, rolled hard, and not annealed. Where an aluminum utensil pits it is usually due to impure metal or an imperfection.

Pure aluminum does not make a good casting, because it becomes more or less porous, and should not be used for utensils in which food is cooked. There is no objection to using a cast vessel for boiling water or frying meats, although sheet utensils used for the same purpose are superior if they are of the proper thickness, purity, and hardness.

Because of the difficulty in having steam-jacketed kettles retinned aluminum is especially adapted for such utensils, inasmuch as it needs no coating of tin; an aluminum kettle properly made should give constant service without repairs.

THE PURCHASE OF CUTLERY AND SILVERWARE

In the purchase of cutlery and silverware for institution use the prime consideration is to obtain the best looking stuff, and that will preserve its good appearance for the longest time for the least money. The ordinary table knife has many uses in the hospital besides the purpose for which it was originally intended. The nurses and hospital help use the knife, and sometimes the fork or spoon, to pry open things, to open windows that are stuck, and they sometimes stick them under the door to keep it from slamming. There may be tools in the institution for these various purposes, but nothing seems to be so handy for the nurse as a table knife or fork, and certainly nothing seems to have so many uses aside from the legitimate one. It is useless, therefore, to buy cutlery that costs very much money. It is even useless to buy knives on which an edge can be put, because they will never be in decent shape at the best, and the money put into good steel is wasted. About the best knife that can be bought is one piece, cast steel, plated with two or three or four coats of silver or even German silver. A very good institution knife can be purchased for $1.75 or $2 per dozen, and if the institution is convenient to a plating establishment the knife can be resilvered at an inconsequential expense. First-class restaurants have a few good steel knives that are kept in good order, and these are distributed as an extra order of cutlery to people who order steaks. If this plan is adopted it will be unnecessary to have the knives in general use sharpened to an edge.

Precisely the same conditions operate in the case of the silverware, forks, and spoons. Forks and the larger spoons can be purchased in quadruple plate of German silver for $1.25 a dozen, and if purchased from a reliable firm that has actually put four coats of alloy on them, the article will be broken up by the household help long before the plating wears off.

For serving the interns, nurses, and the help china or porcelain sugar bowls and creamers and individual coffee and tea pots are used, and they are cheaper, and require very much less attention than silver or plated ware, but it will be necessary to have a certain amount of silver or plated ware in these articles to serve private patients. Nothing dresses a tray quite so well as pretty sugar bowls and creamers and nice looking silverware, but if we use these articles in expensive ware we come upon a unique difficulty. Hotels and restaurants are troubled a great deal with souvenir hunters, but this is truer even in hospitals. It is almost impossible to keep attractive-looking individual sugar bowls or creamers in the private departments of a hospital. Patients' friends think it is perfectly legitimate to carry away as a souvenir any little silver article that happens to attract their attention. If

they are small, daintily made, and odd shaped, so much the more reason why they will be carried away. If they are coarse looking, unattractive, and badly plated, the institution suffers in the poorly set tray. So we are between the two horns of a dilemma. About the only cure for this combination of troubles is in a recently

Fig. 194.—Combination coffee pot, creamer, and sugar bowl.

designed article, which is a combination of coffee or tea pot, creamer, and sugar bowl. This article is shown in Figs. 194 and 195. It has two advantages—one, that it is large enough to prevent its going into the pocket of the souvenir hunter; and, second, that it takes up less room on the tray, because it is, in effect, three

Fig. 195.—Combination set.

stories high. This little article is made in almost any combination of silver, either sterling, quadruple, or triple plate, and costs in proportion. They can be bought in dozen lots at almost any large dealer's for $1.75 each in substantial, heavy plate.

THE PURCHASE OF CHINA AND GLASSWARE

These table articles are rather a matter of choice than otherwise. We are told by dealers that a certain kind of ware will last longer than another, and that it will not break when it falls, that it will not break in hot water, and that it will not chip in the rough handling of washing. We try to make ourselves believe in these virtues, and, with each recurring order of new dishes, we feel that perhaps we have solved the question of china breakage, only to be shocked a few weeks later with a notice that we are again out of dishes. There is no dish made that can be dropped on the floor without breaking; there is no dish made that will not chip under the gentle handling of an athletic dishwasher. Sometimes we buy thin china dishes in the expectation that they are stronger than the heavy stone ware, but they all break in about the same length of time under the same conditions, and about the only question for serious consideration in the purchase of dishes is whether we are willing to pay more for a better looking article that will last about the same length of time as a cheaper one. The cheaper the article we purchase, the more money we will be ahead at the end of the year, and such economies can well be practised with the common help, and to a certain extent with the interns, nurses, and executive officers' tables. But we must pay for style in providing for the trays of private patients. Perhaps the rolled-rim dish will chip a little less easily than the flat rim, but that is about the only advantage in one kind of dish over another.

In some institutions quite an efficient method is practised to limit the breakage of dishes, and that is to compel the breaker to pay for them. The breakage of dishes was cut more than one-half in the Michael Reese Hospital when the board of directors permitted a rule compelling nurses and maids to pay for the dishes they broke.

The careful monograming and marking of dishes will decrease the breakage if a head nurse is given a complete supply of chinaware all containing her own special mark; that is, the number of the floor or service or ward, in addition to the monogram of the institution; and she will not be able to accuse other people in the house of having appropriated her dishes; and if some pieces are taken she can recover them. A good deal of moral force also is contained in this fixing of responsibility.

About the only detail of marking and monograming that is entitled to consideration is the question of gilt. Ordinary colored markings are manufactured in the body of the ware, and the ware is then glazed over, but gilt is overlaid in the glaze itself and will soon wear off. It is, therefore, not desirable as an ornament to any chinaware.

Drinking glasses come under the same consideration as china. The cheap, heavy stuff breaks as easily if the temperature of the water is very suddenly changed; that is, if the glass contains cold water, and that is poured out, and the glass immediately filled with hot water, there is not enough elasticity in the substance of the glass to stand the expansion, and there is a crack which continues until the glass is broken. The heavy, cheap glass will stand more rough usage, temperature excepted, than the thin fine stuff, and a jar that will break the thin glass will oftentimes not break the heavy one. But thin ware will stand alternate hot and cold water much better, and the thin article is very much the pleasanter to use. Then too, there are a good many people who feel that a thick, cheap glass is not worth being careful with, and they seem to handle it roughly on purpose, whereas if the glass is thin, and especially if it has a pretty monogram, they will be more careful with it, so that in the long run it is very doubtful whether the institution will be out any money at the end of the year by purchasing the better grades of glassware.

PURCHASE OF SOAPS

The institution buyer is almost absolutely helpless when it comes to purchasing soaps. In nearly every other commodity there is something in the appearance, smell, or taste that will give a clue to quality and character. But soap makers have learned to deceive in all these particulars, and with soap the old adage is especially true that "all that glitters is not gold." There are two ways to buy soaps—on the honor of the maker as to true soap content, or by chemic analysis, which is the far safer way. In analyzing soap three things must be sought—the percentage of water, because water at soap prices is not a profitable commodity; adulterants, for the same reason; and the litmus reaction, because alkalinity or neutrality is desirable always and absolutely necessary sometimes.

Soaps should be divided, according to their methods of manufacture, into two general classes, boiled and semiboiled or cold made. In the boiled soap the fat and alkali are boiled together to complete saponification, and the soap salted out from the excess of alkali and glycerin which has been separated. This soap base may be used for the manufacture of laundry or toilet soap, depending upon the quality of stock used in its manufacture. The cold-made, or semiboiled soaps, are made by mixing the theoretic quantities of fat and alkali together and allowing saponification to proceed slowly. Included in this class are some cheaper grades of toilet soap, practically all potash soaps, meaning the green soft soaps, and some cheaper grades of heavily filled laundry soaps, chip or bar.

Any soap must be considered from its actual true-soap content, which is a chemic combination of alkali with fat. Fat, as we know it, is a glycerid or a chemic compound of fatty acids with glycerin. Under proper conditions, alkali will split off this glycerin and take its place, leaving a new compound, a salt of the fatty acids and alkali, present, or soap, the glycerin remaining free in the soap unless separated by some process of manufacture. On this basis it is possible to judge the merit of soap of any description and for any purpose. Soaps for special purposes are made by selecting the fat and the alkali to be used; that is, there is a choice in fats of tallows, greases, or vegetable oils; in alkalis, of soda or potash. There are other things mixed with soap other than true soap, which are not added for adulterating purposes unless present in excessive amounts. For instance, soaps used in extremely hard water must contain a certain percentage of free alkaline carbonate, or similar material, to aid in softening the water.

Adulterations.—Adulterants of soap are usually in the nature of fillers or make-weights; the idea is not to pay for make-weights or fillers at soap prices; silica can be bought for a song, but tallow and vegetable oils cost money; but it is not always easy to draw the line where adulteration commences and ends. Pure soaps cost more because the user is allowed to fill his own soaps at filler prices to suit his own conditions, but in selling to private families that have no facilities and cannot buy soap on a sufficiently large scale to permit them to make their own solutions, the filler is added to give the best general working combination. If the quantities of alkali in bar soap are excessive, they have been added for the purpose of carrying additional water, that is, say the soap normally runs 3 to 10 per cent. of free alkali in the soap, for every additional percentage of alkali a correspondingly larger percentage of water can be carried, which, of course, diminishes the true soap value and adds the weight of the water. It is impossible to determine the amount of moisture in a soap by its appearance or "feel." For instance, some apparently dry-chip soaps have more than an average amount of moisture, say 12 per cent., but the moisture is concealed as a water of crystallization of some alkaline filler.

The moisture in the cheapest bar laundry soap will run about 28 per cent.; in green soap, 45 or 50 per cent., depending on the nature of the soap; 35 per cent. of moisture may be made to look like 28 per cent., and 60 per cent. made to look like 50 per cent. by an excess of alkali, and in the added moisture we pay for water at the price of soap.

Samples should be analyzed for the amount of true soap, or the percentage of fatty acids and combined alkali; the sum of these two is the true soap, which is the only part of the soap that has any cleansing properties, with the exception of the free alkali, which can be bought at a cheaper price and added—in the laundry, for instance.

Rosin forms an alkaline salt which is similar to soap, and is a necessary part of some soaps, as it is added to tallow soaps to increase their solubility. The greatest use of rosin is in the common bar rosin soaps.

Free mineral grits, which are usually silica, talc, volcanic ash, pumice, or marble dust, are usually adulterants; fillers of this sort are only of value in scouring soaps; in soaps for washing purposes they are simply added for weight.

Adulterants That Have No Value.—The principal worthless adulterant is starch; this not only adds its own weight, but has the capacity to carry additional water. Talc enters this same class, as it has very little scouring property.

Relative Value of Soap, or True Soap Content, in Money.—Take, for instance, this illustration: "A" soap costs 7½ cents per pound; "B" soap costs 6 cents per pound; on analyzing, we find that "A" soap contains 88 per cent. of true soap; "B" soap contains 65 per cent.; dividing 65 by 88, and multiplying by 100, we get about 74, the percentage value that "B" is of "A." Taking this percentage of 7½ we find that "B" should only cost 5.36 cents per pound, because of the small amount of true soap that is in it. Looking at it in another way, soap "A" is costing 7½ cents per pound, or $7.50 per 100 pounds. In soap "A" there are 88 pounds of true soap. Then each pound of true soap will cost $7.50, divided by 88 pounds, or 8½ cents. Soap "B" is costing 6 cents per pound, or $6 per 100 pounds, and contains only 65 per cent. of true soap, so per pound of true soap it will cost $6, divided by 65, or 9¼ cents. So it is seen that the true soap (the part wanted) can be obtained for less money by buying the more expensive chip.

Steam Laundry Soaps.—For laundry purposes a chip soap is to be preferred; the chip soap is much more conveniently handled, because laundry soaps must, in any event, be dissolved before using, and the chip soap dissolves much more readily than bar. It is quite easy to obtain chip soap containing no filler whatever, while practically all bar soaps contain a certain percentage of filler in the shape of free alkaline salts, such as soda ash. This can be bought cheaper, and added by the laundryman to suit the special conditions of the laundry. There is another point—practically all bar soaps are rosin soaps; this rosin has a soap value, as before stated, but is not considered equal to that of tallow, and is added to the tallow bar soap to make it more soluble, and, therefore, more satisfactory, since the tallow or chip soap is easily dissolved, there is no need of this percentage of rosin being present, and we get the full value of the fatty stock as against rosin, so that, pound for pound, though apparently much more expensive, the chip soap will be cheaper in the end.

This chip-soap solution, which we have described for steam laundry purposes, may be also used quite as economically for whatever hand work there may be to do in the steam laundry wherever there is a sufficient amount of work to justify making it up. This chip-soap solution is being used in many places advantageously and economically for dishwashing purposes, and, where the use of it can be controlled

at all, it will no doubt be cheaper than bar soap for this purpose; the chief disadvantage in the use of this soap for dishwashing purposes is that maids are disposed to use too much of it unless they are watched, but this fault can be counter-balanced by cutting the amount of soap in the solution; that is, by making it thinner.

Soap Powders and Scouring Powders.—Soap powder is a mixture of sodium carbonate or commercial soda ash and soap finely powdered, with moisture added. It is a handy and strongly alkaline soapy cleansing mixture, its value being based upon the content of true soap and of sodium carbonate, and also upon the fineness of the powder, because of the greater readiness with which it goes into solution. Sometimes soap powders are found in which the soap is present in hard granular kernels, which are rather slow in going into solution; in a good soap powder it should be practically impossible to distinguish between the grains of soda ash and soap with the naked eye.

The best scouring powders are composed of well-selected clean mineral grit, sharp enough to cut the stains and dirt and not hard enough to scratch, combined with a small percentage of free alkali and soap to emulsify any greasy matter. These should not be mistaken for washing powders, and are to be used with a minimum quantity of water, and not flooded, as in the use of soap washing powders. One of the common mistakes of people in the use of scouring powders is that they use too much water and flood the powder, and thus destroy its scouring property. It is a common mistake in hospitals to throw the used water with scouring powder into the basins and closets, which, on account of the insolubility of the particles it contains, has the effect of clogging the plumbing.

Cheap powders are apt to contain harsh and injurious particles which scratch the floors and marble, wear them out quickly, and are very apt to contain unrefined minerals, which leave dirty marks in their wake; these cheap powders also are apt to have in them large quantities of tailings of grit, which weigh and cost money, and the particles are so fine that they are practically useless for scouring purposes.

Green Soaps.—The so-called green oil soaps may be divided into two classes—(1) those to be used strictly for surgical purposes, and (2) the commoner soaps for woodwork and other cleaning about the institution. All so-called green oil soaps are essentially potash soaps, whereas the toilet soaps and laundry soaps are soda soaps.

The surgical green soaps are made according to the U. S. P., under the Pure Drug Law, which calls for linseed as the fat constituent. It may be doubted whether linseed oil has any value over cotton-seed oil, the new Soya bean oil that is just coming into use, corn oil, or, if they were not too expensive, the olive oils; it is probable the Pharmacopœia originally specified linseed oil because there was no cotton or corn oil.

The surgical soaps usually contain 50 per cent. of water, and the Pharmacopœia requires a slight excess of alkali. The other 50 per cent. is made up of fats in the shape of linseed oil and potash, together with a little free potash, to comply with the Pharmacopœia requirement of an alkaline excess. Very frequently manufacturers color their surgical soaps with grass coloring-matter to give them a rich green appearance, and this adulterant stains whatever it comes in contact with. True green oil soaps are not green at all, and certainly not bright green; they are amber, with a very faint suspicion of a greenish tinge, if any olive oil has been used in their manufacture.

The cheaper soaps are practically the same composition, with the exception that the fats are of cheaper grades, not so well refined; and there is occasionally a per-

centage of rosin, which is of no particular value, though not considered adulterant, but merely a cheaper form of necessary stock. In purchasing these cheaper forms of green oil soap for the commoner purposes of the hospital there is danger of paying for a large excess of rosin at a price that ought to buy a better stock; usually these cheaper green soaps are also filled with an excess of alkali in the shape of free alkaline salts; even a part of the potash is occasionally replaced by soda, which tends to harden the soap and make it carry more water.

In either of these classes of potash soaps the body, or hardness of the soap, cannot be taken as an indication of the moisture content, because a solid fat will give a much harder soap than liquid fat, the moisture content being the same. For instance, tallow as a fat basis would make a very much harder soap than the same proportion of cotton-seed oil, and the tallow soap might be watered a great deal more and still appear as a richer soap, whereas one is paying for a large quantity of water at soap prices.

Uses of Green Oil Soaps.—Green oil soap can be used to clean painted and varnished surfaces without injury. The best method for painted walls and ceilings is to make an emulsion, by cooking for about an hour 1 pound of green oil soap in 4 gallons of water; apply this emulsion with a sponge to the surface and immediately wash off with clean water, and wipe dry with a damp cheese-cloth or chamois. The result will be a bright and almost new appearance. A very dirty wall may require a second light cleaning with a little green suds; always clean walls working from bottom up to prevent streaking with dirty water.

To clean furniture and varnished woodwork it is best to first cook up the green oil soap, and then make the required soapsuds strength from this soap stock. The most economic way to use green oil soap for scrubbing hardwood, linoleum, mosaic, and made-marble floors is first to make up a soap stock—*i. e.*, 1 part soap and 6 parts water, and add a little soda or washing powder to give it added alkalinity. Use a half-pint of this to a scrub pail to make the suds.

Toilet Soaps.—*Castile Soap.*—Toilet soap for institution purposes may be divided into two classes, one for use on the delicate skin of infants and for bath purposes of the sick, where a soap of great softness and mildness, combined with great cleansing properties, is essential. For such purposes the olive oil soaps stand alone. It must be understood that all olive oil soaps are Castile soaps, but all Castile soaps are not olive oil. Genuine Castile soap is made abroad and imported in the shape of soap; it can then be cleaned of filth and extraneous matter, milled, and reshaped. Due to trade conditions it is practically impossible to get the right quality of oil in this country for making the best grades of olive oil soaps, so that it is frequently found that domestic Castile soaps, if made from olive oil at all, contain only the lower grades or, more frequently, only olive oil substitutes; that is, other vegetable oils.

Other Toilet Soaps.—The second class of toilet soaps may be subdivided into three classes: first, milled soap; this is soap which, after saponification, has been dried and then milled, perfumes being added in the milling. This milling process is one of the finest mixing, and might be explained by describing the machine, which is composed of granite rolls, revolving very closely together, the soap being forced to pass between these rolls in a plastic state; this process kneads the soap into a homogeneous mass. Such soaps are usually very low in moisture, not running over 10 or 12 per cent. This process is used for all higher grade soaps, one reason being that the more delicate perfumes can be worked into the soap cold, while if such perfumes were added to a hot soap they would be destroyed. The base of this milled soap is the same as any soda soap, that is, any animal or vegetable

fats. During this process of milling any medicament may be incorporated to make the medicated soaps, and any colors are usually added in at the same time, also such fillers as starch.

The second class is composed of the floating soaps; these are soda soaps, usually running fairly high in vegetable oils, especially cocoanut; the property of floating is obtained by simply churning air into the mass while the soap is in a liquid state, and, of course, milling as in the above class is entirely out of the question, as this would again release the air; these soaps carry a large moisture content, about 25 per cent.

The third class is the so-called semiboiled, or cold-made soaps, in which the alkaline and fat, perfume, and any other ingredients are simply mixed together in theoretic proportions and the saponification allowed to proceed slowly. Practically, all transparent soaps are of this class. The danger with this class of soaps is from improper mixing; that is, the addition of too little or too much alkali for the amount of fat present, which means, of course, free fat in the soap, or an excess of free alkali, and the saponification is apt to be incomplete.

PURCHASE OF JANITORS' SUPPLIES

The most destructive and careless people in the world are institution common help. The wages for such service as scrubbing floors and washing windows, walls, and woodwork are necessarily low, and hence the mental caliber of such servants is almost a negligible quantity. It naturally follows that, in the purchase of supplies for such people to use, the prime considerations must be, first, that the article will do the work quickly with the least amount of labor, and, second, that it shall be as nearly indestructible as possible. It is not a question of how cheap an article is as to first cost, but how cheap it is considering the work it has to do and the length of time it will last.

Another most important consideration just here is the method of distribution of janitors' supplies and the system by which the most possible work can be got out of an article. For instance, it would be folly to compel a maid to use a corn broom on fine carpeting after it had been worn down almost to the wire binding. The wear on a carpet swept with such a broom would be far greater than the foot-wear. But such a broom will answer well for sweeping out the laundry or power house, or in the yardman's department. The same rule would apply to mops and scrubbing brushes. To bring about a proper exchange of such articles there should be a regular and pretty rigid system of distribution. First, there should be some fixed and well-known hour and day on which supplies should be drawn, and anything wanted in emergency should be subject to a good deal of "red tape," to impress on the minds of the people the necessity to observe the time rule.

Every servant who asks for a new article should be compelled to bring in the old one, or its skeleton, or to go through a catechism as to its whereabouts in the event it cannot be produced; then the head janitor or storekeeper can determine whether the article is past further usefulness in the hands of that particular servant and whether it can be used elsewhere. Besides, if the return of worn-out articles is insisted upon, there will be fewer articles stolen by the help and taken from the premises, and an article will often be used much longer, because servants are very fond of new things to work with, and will often throw away very slightly worn tools. Sometimes they will actually complete the destruction of an article just to get a new one; a good janitor can frequently tell by the look of an article whether it has actually been worn out or broken up.

Mops and Pails.—The most important articles in the janitor's department are the mops and pails. Let us first see whether and where we are going to use mops. In the old days of institution construction there was much soft-wood flooring and other woodwork. Generally varnish was used when the buildings were constructed, but this soon wore off the floors and the bare wood grain was exposed. Nothing will clean unvarnished or unwaxed wood but a hand scrub brush, a powerful arm at the end of a supple back, and plenty of hot water and strong lye soap.

But there is too much floor space in institutions nowadays, and help costs too much to justify the time and labor of hand scrubbing; moreover, most floors are made of concrete or marble, which do not require such hard work in cleaning, or hardwood, with heavy shellac and varnish or wax finish, which cleans very readily and very adequately with a damp or even dry cloth. About the only thing hand scrubbing and hot lye soap water will do to a varnished floor that a damp mop will not do is to take the varnish or wax off. There are still some places that require hand scrubbing, mostly hallways, that cannot be covered with linoleum and that are too much used to justify frequent varnishing, kitchen tables, drain boards, and pantry shelves. But the hardwood floors of private rooms and wards and the marble, mosaic, or concrete or corridors and service rooms can be kept quite clean with a carefully used mop.

Nothing gives to a room or corridor so untidy an appearance as strings of mop cotton stuck into cracks or about furniture feet, stair-rails, and door-steps; this comes from using the cheap mop twine, which is practically a cotton waste with so short a fiber that it comes apart on the slightest pull after a few hours of wetting. These cheap mops cost about $25 to $30 a gross, or from 15 to 20 cents each, according to the weight. There is another mop of long-fiber cotton twine that costs 50 cents, but one such will wear longer than a dozen cheap ones, and in the course of the year will be vastly cheaper to use.

Some day some one will devise a mechanical mop pail that will perform the service needed and make a great feature; there is none on the market now that is satisfactory. The mechanism that locks the mop in the pail between the rollers, which releases it by a dead pull on the handle is the worst, because it tears the mop to pieces quickly. The one that requires the operator to hold his foot on the wringer lever while he turns the wringer rolls by a handle is just a little better, because it takes a carefully adjusted foot-pressure to do the trick.

Brooms and Dusters.—As we have seen in our section under Equipment on the subject of vacuum cleaners, there is no tool concerned in vacuum cleaning that will take the place of the old-fashioned corn broom for bare floors and cracks, but the vacuum cleaner ought to be used as much as possible and wherever possible, in order that the dust may be actually picked up and carried out, and not scattered about to fall in some place, perhaps on an open wound, or be inspired by the patient or attendants. Brooms and dusters are poor things in a hospital, and especially dusters. There are many places where the broom must be used, and the only kind to use are those that are drawn with wire, because the cotton- or hemp-twine drawings will soon rot and the broom will fall to pieces. Wire-drawn brooms cost more than the others, but they will last more than twice as long. Cheap corn brooms are the dearest that can be bought. The best substitute for the corn broom is the mule-hair, double length, wire-drawn brush, and the larger the size the better the service. The brushes need to be washed frequently in tepid or cold water; when the bristle is laid in pitch, as is a common practice with makers, hot water will soften the pitch and break up the brush. These mule-hair brushes cost from $1.50 to $3 each, but they will last for years with care-

ful using. On all floor brushes there should be a felt binding, so that the hard edge of the wood part of the brush will not knock the paint off the walls and varnish off the furniture.

One of the most useful brushes in an institution is the radiator brush, intended to reach between the coils of the radiator, and a very special brush is required for this purpose. The sanitary hopper and toilet-bowl brush, the radiator brush, the bed-pan and urinal brush should be all wire drawn and fastened on a metal handle, preferably heavy tipped wire. Properly made brushes of this sort can be cleaned any number of times, and, as it is the cleaning process that wears them out and not the actual use, they should be made so that they will stand hot and cold water, soapsuds, and disinfectants, and wooden handles will not stand these things nor will twine binding.

There is a wall-cleaner brush that is very excellent. It is made of short ostrich feathers, and seems to be the only brush that can be used to pick up dust and not scatter it. It can be cleansed by a gentle washing in lukewarm water. In some places they use this brush wet for washing windows. It is a very durable brush, and will last for years if taken care of. Where there is much floor to keep clean, and especially where the floors are very much used by people with muddy shoes, there is a sort of scrubbing brush known as a "deck scrub." It is about twice the size of the regular scrubbing brush, has a high, heavy wooden back, the whole containing a long handle. Scrubbing cannot be done quite as well on the hands and knees with this brush, but it is a very good substitute if used vigorously. The difference is that the operator can use it without getting on hands and knees.

THE HOUSEKEEPING DEPARTMENT

The Housekeeper.—People in this world occupy large or small places, not because of the largeness or smallness of the places themselves, but according to their ability to fill them. Nowhere is this truer than in the personnel of the housekeeper or matron in an institution of any sort, whether it be a hotel, sanitarium, or hospital. We may employ a woman as matron for an institution, and map out for her the duty of looking after the female help, to see that the floors and rooms are kept clean. There are women wholly incompetent to fill even so limited a place as that, but there are other women who will do the work assigned to them, and do it well, but who will do no more than that, and in such a position will have reached the height of their capabilities.

But there are other women, and we all know such, who literally take possession of the housekeeping atmosphere about them, who not only attend to their own duties, but who are constantly helping out on something else; and this world is full of work for people who are looking for it; busy and competent women, who know how to manage things and get work out of people and to make the housekeeping parts dovetail each into the other. And these women will constantly find new duties to perform, and if they cannot find them they will make them, until the whole establishment, upon its domestic side, will take on an atmosphere of businesslike activity, and the stamp of the housekeeper will be upon it all.

In attempting to define the duties of a housekeeper, therefore, we find ourselves confronted with a personality, and no one who has charge of the administration of any sort of large institution could write about the domestic side of it without a picture in his mind of some individual, and his story of housekeeping would be an epitome of the life-story of some particular woman.

In a small hospital the duties of the matron or housekeeper may be merged with those of the superintendent of the training-school and the superintendent of the hospital, and a large measure of the success of such an institution will depend on the ability of the woman at the head of it, not as a nurse or superintendent, but as a managing housekeeper. Of course, in such an institution the woman must be a many-sided person, and the broadness of her success will be measured by her abilities in many directions; as, for instance, she must have diplomacy and tact to deal with the public and with the medical staff and with the interns. And, in order to deal with the medical staff and with the training-school, she must have great technical ability and poise. But in a final analysis of her achievements at the head of the institution her housekeeping performances will shine out as the thing that people will talk about. An immaculate establishment, clean linens and a well-disciplined force will make up, in the eyes of the directors and those interested in the institution, for many a shortcoming elsewhere.

It has been said frequently by those who ought to know that a woman, temperamentally, is not calculated to handle subordinates; that she is likely to domineer and dictate to a point that men will not work for her, and that the same woman is likely to be so unjust to her female help, in favoring some and driving others, that no proper discipline can be maintained among the females of the establishment.

The experience of some of us, however, does not bear out any such presumption, and we would prefer to fall back again upon the personal equation. It is a case of *the* woman in the concrete and not the woman in the abstract, because it is *the* woman who is running the establishment and not womankind at large.

It has been said again that the female mind is not of a mechanical turn, and that a housekeeper, ever so good in other particulars, cannot direct affairs in an institution that has to do with the mechanics of the place—the lighting, heating, elevators, dumb-waiters, and so ad infinitum. It is probably true that women are not mechanics, and that they are not of a mathematic or even a mechanical turn of mind. But there are some women who can get more good work out of a plumber than almost any man by the force of their personality, coupled with a few kindly hints of a very commonplace but also of a very common-sense character. And that holds true in the laundry and in the power plant and everywhere else in the institution.

These thoughts would seem to lead up to the fundamental idea that a housekeeper's duties in an institution are just what she is capable of making them, and, while there may be many objections on the part of the heads of other departments in an institution against the usurpation of their powers, privileges, and duties by a housekeeper, we will rarely find this to be the case where there is a commanding figure in that position; the figure of a woman, so busy about getting things done that she has no time to hear complaints about her activities, and who is even too busy to see sour faces. But she is likely to see all the loafers on the place, and see them when they least expect it. And such a housekeeper as we have been picturing is very likely to add to all her other abilities such a fine intuition that she can detect a loafer even in his busiest moments.

Every one of us can recall valuable experiences with housekeepers. We can retrace our steps in hospital administration, and look back upon some one particular occasion when a housekeeper was employed with the most limited duties, and we can remember how we were freed from anxiety about a lot of things that had bothered us before; how things began to take on a clean and tidy look and a business-like air. And about all we can remember distinctly of that period is the fact that we seemed to meet the housekeeper at every turn of a corridor and on every floor of the house. Presently something entirely outside of her duties would annoy us, and we would appeal to the housekeeper, and immediately that particular thing seemed to vanish as a problem. Then something else would transpire, and that, too, would be smoothed out and we would be permitted to forget it, and we would wake up some fine morning, making a mental retrospect, to find that most of the establishment had been taken over by the housekeeper, and that no matter what was wanted she had to be appealed to.

It can hardly be surprising, therefore, if one who has been particularly happy in his experience with housekeepers should set out upon a discussion of the domestic side of institution management with something of a panegyric upon that good soul, the housekeeper, and hardly less surprising if he should take her as a foundation key upon which to build a fabric of domestic tranquillity and efficiency.

We may now proceed to take up the threads, one after another, of the domestic fabric, and think about them from the mental view-point of the efficient housekeeper.

FEEDING THE HOSPITAL

OPERATIONS IN THE KITCHEN

Good housekeeping starts in the kitchen; it begins with a clean kitchen and it proceeds with clean utensils, clean and efficient help, with properly purchased, properly cooked, and properly served foods. It may be that there is a steward in the establishment entirely separate from and independent of the housekeeper, but it is not very likely that a steward or buyer will continue for very long to furnish kitchen commodities that an efficient housekeeper has occasion to find fault with, so that, even where the establishment is so large as to afford a contract buyer or a steward or both, the housekeeper, when the last word is said, is the final court to determine the quality and economy of food supplies.

We do not dwell on the number of people necessary to perform the work in the kitchen; that will depend wholly upon the size and many-sidedness of the institution and the number of people to be fed. Therefore, we may discuss the steps of the work in the kitchen instead.

Let us take, for instance, the butcher shop and the presiding genius of that establishment, because the meats are perhaps the most important article of food—at least from the standpoint of institution management. The butcher may have an infinite variety of other duties to perform, because his establishment may be very small and his duties of meat-cutting light, but, whatever else he may have to do, no particular ability that he may possess in any other direction will pay nearly so well as his ability as a good meat-cutter, and it makes no difference whether a few roasts and steaks and chops and boiling joints are the sum total of the day's meats, or whether whole carcasses measure the demand, there is more in cutting meat properly than in any other single economy in the house, except, perhaps, the buying of meat properly.

In a good many institutions that are well conducted only one quality of meat is purchased, and that in carcass size and of the very best quality, short of what are called fancy stocks. When the butcher comes to his task in the morning he has in his mental vision quite a few classes of hospital inmates to provide for. There are the nervous, hard-to-please private patients, never hungry at best, and likely just now, since they are in the hospital for some real or fancied illness, to be harder than ever to satisfy, and naturally they must have the choicest morsels—the tenderloins, for instance—because, while from a purely physiologic and chemic standpoint the tenderloins are not so nutritious as some other parts of the carcass, they are at least supposed to be daintier and more tender. Then there are the convalescents and other sick people who need the most nourishing foods, such as the sirloins, and the ward patients, postoperative surgical cases, perhaps, who need strong, nourishing meat rather than the tempting tidbits, and without particular reference to its tenderness so long as the chemic strength and filling power are there. Then we come to the well people of the establishment; the guests' dining room, to which must go very choice viands, because the people who eat in the guests' dining-rooms are usually the friends and relatives of very sick patients, and they are anxious and in trouble and their appetites must be tempted; so they must have the fancy pieces, daintily served. Then we come to the hard-working, robust people of both sexes, the interns and nurses. It is no easy task choosing quality or quantity or variety of meats for these young people. They are robust and hardy, it is true, and they work hard and should have good appetites for any plain, wholesome food, but, as a matter of fact, they are confined a good deal in the establishment, do not get nearly so much oxygen into their systems as they ought to have because con-

fined to the house too much, so their metabolism is not of the best and they clog up easily, and are frequently "off their feed," as the farmer would say of his stock.

Then, last of all, we have the downstairs help. And just here we reach a sore spot in hospital management, not only concerning meat, but in all the other table supplies. A good many of us "save at the spigot and waste at the bung" about our downstairs help. We spend all we dare on the rest of the house, and by the time we get to the downstairs help the spirit of economy has firm hold of us, and it is a question, not what we shall feed our help, but how poor a quality may we feed them and how small a quantity, and yet keep them in a temper to remain in the service with sufficient strength to perform the duties for which they are paid. These people are not accustomed to the choice cuts of meat—they never had them at home—and the choice cuts are by no means the most nourishing after all. There is not nearly so much nourishment, pound for pound, in a tenderloin steak as there is in a round steak or a round made into a pot roast. But boiled meats lose a good deal of their nutritive value in the process of boiling, and yet an average floor man will eat four or five times more in weight of a steak than he will eat in a roast. It is no exceptional case for a working man to eat a pound and a half or even two pounds of steak if he can have it; but, if the meat is a round roast or a pot roast, and if it be served with good, rich gravy and plenty of potatoes, well cooked and well served, one-sixth or one-eighth of a pound will fulfil every gastronomic purpose. Stews of various sorts may be frequently served to the help, but those people are entitled to have their stews made out of good, clean, fresh meat, and it is just about as easy to make a good stew as it is to make a poor one. There is no more attractive or appetizing dish than a properly made beef-stew, with a little onion and red pepper, quartered potatoes or dumplings, not with milk-colored, dish-water gravy, but the rich, brown gravies of the army "mulligan."

Then we have the ground meats that can be prepared and served in an infinite variety of ways. Meat-balls, as they are served in many institutions to the common help, are about as uninviting a dish as can well be conceived; as a rule, they have no seasoning and are fried in left-over grease; sometimes they are cooked so long that but for the rancid grease they would have about as much taste as a thoroughly rotted piece of drift-wood. But let us take the same ground meat, add to it just a suspicion of garlic, or, far better, some finely chopped onion; take about twice as much finely chopped potatoes as there is of meat; bake in deep pans with a bottom crust of good pastry and a top crust of the same; make the pie of such consistency when it is done that it will not run over the plate; there is hardly a nicer dish, even for the rich man's table. Sometimes this same mixture can be made in little individual rolls, using a good pastry; turn in a sufficient amount of the meat and potato mixture to serve one individual; and precisely the same mixture can be cooked down for hash, and if the gravy be browned it makes a delicious dish.

Now let us go along with the help's table until the Sunday dinner. Chicken usually costs a good deal of money, and most institutions can hardly afford to serve chicken to the common help as a regular thing. But there are quite as many economies to be practised in the killing and preparing and serving of poultry as in other kinds of meat, and it may be safely ventured that the help can be given a Sunday dinner of good, healthy, but old and tough, and consequently cheap hens, at a price that will compare very favorably with almost any other meat; not roast or fried or boiled chicken, but chicken with dumplings or fricasees, with plenty of dumplings and plenty of gravy, and for a change they may have what the French call "jambolia." This last dish is a very delicious one; the fowls are disjointed—not chopped

up with a cleaver and their bones all broken—and cooked until the pieces just hold together; an hour before they are done a few onions may be dropped into the pot and a little red or green pepper with the regular seasoning of salt. A large quantity of broken rice—broken, because that is the cheapest form of rice and quite as good as the whole grains—should have been soaking in cold water while the chicken has been cooking, and just as the chicken is done the rice may be dropped into the pot. Then another half-hour of simmering, and the rice is thoroughly cooked, and the chicken about ready to fall to pieces.

All these are suggestions to help out the butcher in his oftentimes difficult task of making his food allowance check up consistently with the appetites of the people he must feed.

Preparation of Vegetables.—Some day some enterprising manufacturer of a vegetable-peeling mechanism will give us some exact data as to the efficiency of this mechanism. Up to the present time we can only speculate, and apparently there has been no attempt, except in the way of high-sounding adjectives, to prove to us that there is a real saving in the mechanical peeling of potatoes, turnips, carrots, and other root vegetables. This much may be said, every mechanical device for peeling these roots that we have offered to us to-day gives us an uncertain result. They do not peel the same thickness from all parts of the outer surface of the vegetable, but they do take the peel off, and with it an indefinite amount of the very best part of the vegetable. There are two parts to a potato—the inner part that is almost pure starch, and a thin rind, just under the peel, that contains whatever protein is in the potato. It may be urged that we also lose this protein value in the peeling of the potato by hand, and that is true, but what we want in the mechanical potato peeler is a device whereby this best part of the potato can be saved, and we haven't it yet. Moreover, the mechanical potato peelers of the day do not take out the eyes, and they leave the peel wherever there is a straight or concave surface, and only perform their work where there is a distinct convexity. The old-fashioned hand-worked apple peeler of thirty years ago was a far more perfect mechanical device than anything we have to-day for peeling potatoes, because it did follow the irregularities of the surface, and it may be very pertinently inquired whether there is a real saving of time, either over entire hand work in potato peeling or over the old-fashioned apple peeler, because, with the new device, we must go over each potato by hand anyway and take out the eyes, the straight or concave surfaces that have not been peeled, and any specks that may exist. Almost all the manufacturers of vegetable peelers show, for private inspection rather than on their catalogues, figures to prove the saving in weight of the potato-machine peeler as compared with hand work; but these figures contemplate weighing the potato immediately after it goes through the mechanical device and before the necessary amount of hand work is done, so that the figures are not entirely disingenuous. However, we have shown in the section on Equipment of the Institution some of the best forms of mechanical vegetable peelers, and have pointed out somewhat the difference between the various makes, and the hospital administrator must, at least for the present, be the best judge whether the conditions surrounding him would seem to call for a mechanical device rather than hand peeling.

There is very little to be said about the advantages or disadvantages of mechanical against hand cleaning of most other vegetables. Peas must be shelled by hand as of old. Strawberries must be stemmed in the old way. Lettuce must be washed leaf by leaf. The cleaning of spinach may be open to a word of debate; most of us are familiar with home-cleaned spinach, especially for large institutions, and the experience is not a pleasant one. Most home-cleaned spinach retains

much grit, and for institution use it may be fairly doubted whether canned spinach is not more desirable. The canners of that commodity seem to have some peculiar method by which they make way with all the grit, and if the higher priced brands of canned spinach are purchased there is always a debate by those at table as to whether or not it is a fresh or canned vegetable, and agreement will only be reached on the one point, that the article is especially free from grit, and there are some of us who pretend to be able to judge by that fact alone whether we are eating canned or fresh spinach.

Divisions of Table Service.—It is an arduous and thankless job for the housekeeper, dietitian, or chef who has to make up menus for the various classes of institution inmates day after day, and it must often be done without much reference to likes and dislikes, and sometimes without any thought of the availability of the food as actual nutrition. Perhaps a few suggestions may be grateful to the tired one, who is at her "wit's end" to think of something new and inviting with which to meet the all too common complaints of sameness.

Digestion, in a final analysis, is a process of oxidation. The concentrated foods —that is, the heavier foods and those containing the most real nourishment— require most oxygen for their assimilation. People leading active out-of-door lives are abundantly able to dispose of these concentrated foods, such as meats, while those living sedentary and indoor lives should have such foods in much smaller quantities. Interns and nurses are active, it is true, but their lives are rather irregular, and are spent in sick rooms, with comparatively little sunshine and fresh air; such habits do not lend themselves to food oxidation; therefore, they do not need a great amount of protein food in concentrated form, though what food they have should contain plenty of nourishment, and in a form that will call into activity all the organs of digestion and elimination, and their food should have sufficient variety and attractiveness to excite the appetite, however tired and depressed they may be. Carbohydrates, and the foodstuffs which Hall has so aptly classified as carbonitrogenous, should predominate in their bills of fare. Meat and eggs once a day will supply the body needs, if vegetables and nuts be added in amounts to suit the appetite. Such foods as these will furnish the bulk, so necessary an aid to digestion, as well as the protein, and may be served in such a variety of ways that monotony will be avoided. The nuts will add to the supply of fat, and thus increase the energy-producing fuel and at as small an expense as less valuable foods.

Desserts of milk, eggs, and fruit can be put together in such an infinite number of ways that there is no excuse for a tiresome "sameness." Salads, be they ever so simple, are appetizing if only for the bit of green furnished, and may produce a desire for other food—a point of no small value to those who are very tired or for some other reason do not care to eat.

It will generally be found that nurses and interns are well content with a light breakfast. The expense spared here can be added to the other meals, or, at seasons of the year when fruit is more expensive, it will be appreciated if this is served even occasionally, though the regular breakfasts are more simple. All things considered, it costs no more to serve a salad or fruit than it does to serve a soup, so these may be interchanged or alternated for dinner.

As to the downstairs help, they, too, must have nourishing food, and it must be varied, but their appetites should be appeased rather than excited, and they are apt to scorn the so-called dainties as not worthy of being called food. The more nourishing cuts of meat, spaghetti, macaroni, beans, puddings of cereals, and eggs are all suited to their needs, and, if properly prepared, will be found most satisfactory.

Sample Menus for the Help

Sunday.

Breakfast.

Cereal.
Mashed potatoes. Fried eggs
Bread. Coffee cake.
Coffee.

Dinner.

Vegetable soup.
Chicken with noodles.
Boiled potatoes. String beans.
Steamed chocolate pudding.
Coffee.

Supper.

Cold meat. Baked potatoes.
Apple sauce.
Plain cake.

Notes on Sunday Menu.

Hens may be bought at a very reasonable price, and if cooked below boiling-point can be made tender and of good flavor; served with noodles or dumplings less of the chicken is needed, and yet an appetizing serving is made. The expense is warranted by the satisfaction given to the help in being made to feel that they are regarded as human. There is no cheaper or better dessert made than steamed chocolate pudding as well as some other steamed brown puddings, and they are very easily made. The supper fits in nicely with the other menus.

Monday.

Breakfast.

Cereal with milk.
Fried potatoes. Liver and bacon.
Bread. Coffee.

Dinner.

Scotch soup.
Roast beef. Brown gravy.
Boiled potatoes.
Swiss chard (leaves).
Pie.

Supper.

Boston baked beans.
Stewed tomatoes.
Peach tapioca.
White bread. Rye bread.

Notes on Monday Menu.

This menu fits in with that of the full diets and guests very nicely. The bacon need not be of as good cut, and the liver will reduce the expense of the breakfast and yet not reduce the satisfying property. For dinner, the better part of the roast may be served upstairs and the remainder downstairs; in the same way, the stalks of the Swiss chard to the guests and private patients and the leaves to the other dining-room. The same dovetailing may be followed out in the supper with the tomatoes and tapioca

Tuesday.

Breakfast.

Cereal with milk.
Rice cakes. Baked apple.
Bread. Coffee.

Dinner.

Rice soup.
Beef steak smothered in onions.
Boiled potatoes.
Lemon bread pudding.

Supper.

Spaghetti and Tomatoes.
Cheese. Escalloped potatoes.
Peaches.

Wednesday.

Breakfast.

Cereal with milk.
Hamburg steak. Potatoes.
Bread. Coffee.

Dinner.

Turkish soup.
Veal stew with dumplings.
Potatoes. Carrots.
Bangor pudding.

Supper.

Fried sausages.
Lyonnaise potatoes.
Plums.
White bread. Brown bread.

Menus for Private Patients and Guests

Because of the "servant problem" it is often necessary for dinner to be served at midday. Menus arranged judiciously will permit the same things to be served in the various dining-rooms the same day; or perhaps the left-over meats from one day can be served, sliced cold, or reheated in some appetizing combination, the following day; the unused vegetables can be served en casserole to the help. Meat

need not be served oftener than twice a day. Very little so-called heavy salads or puddings should be served.

SUNDAY.

Breakfast.

Canteloupes.
Cornflakes. Farina.
Pigs in Blankets.
Toast. Rolls.
Tea. Coffee. Cocoa.

Dinner.

Tomato bouillon.
Celery.
Roast chicken with dressing.
Jelly.
Mashed potatoes. Asparagus.
Pineapple salad.
Ice cream.
Tea. Coffee. Cocoa.

Supper.

Cold roast beef and ham.
Baked potatoes. Sliced cucumbers.
Berries.
Cake.
Tea. Coffee. Cocoa.

Notes on Sunday Menu.

Plan for meals which are easily prepared, as there are always fewer maids in service on Sunday. Custom has established the idea that Sunday is of necessity chicken day. Because chicken for dinner is prepared on Saturday, it is an opportune time for serving the livers in bacon for breakfast, which is known as "Pigs in blankets." This utilizes the livers in a way that is both palatable and attractive, and makes a pleasing change of breakfast meats and at the same time economizes by using something inexpensive. This menu requires a comparatively small amount of work in preparation, and yet it is adequate and appropriate.

MONDAY.

Breakfast.

Plums and grapes.
Toasted rusks. Wheatena.
Bacon.
Toast. Rolls.
Tea. Coffee. Cocoa.

Dinner.

Bouillon.
Olives.
Roast beef. Horseradish sauce.
Mashed potatoes. Swiss chard (stalks).
Lettuce salad.
Snowball pudding (steamed).
Tea. Coffee. Cocoa.

Supper.

Cream of celery.
Croutons.
Potato au gratin. Sliced tomatoes.
Tapioca tutti frutti.
Coffee. Tea. Cocoa.

Notes on Monday Menu.

Always serve a clear soup with a heavy meal; cream soup has sufficient food value to be a main dish at luncheon or supper. Roast beef will be well balanced by the vegetable and salad in this case. Horseradish sauce, made with whipped cream, furnishes the needed stimulus for a sluggish appetite; cheese with the potatoes and nuts with the tapioca are sufficient protein and fat for supper.

TUESDAY.

Breakfast.

Baked apples.
Puffed rice. Oatmeal.
Soft-cooked eggs.
Toast. Rolls.
Tea. Coffee. Cocoa.

Dinner.

Fruit cocktail.
Wafers.
Braised sweetbreads with mushrooms.
Mashed potatoes. French peas.
Peppers stuffed with neufchatel.
Charlotte russe.
Tea. Coffee. Cocoa.

Notes on Tuesday Menu.

Sweetbreads contain nucleoprotein, a form richer than that in beef, but in smaller amounts, so the peas and cheese may well be made a part of the meal. Chicken and spaghetti combination is a very good way to utilize cold chicken, as well as an unusual way to serve a thing which always stimulates the appetite.

Supper.

Chicken tetrazzinni.
Gouged potatoes. Celery salad.
Stewed plums.
Gold cakes.
Tea. Coffee. Cocoa.

Wednesday.

Breakfast.

Shredded wheat biscuit with fruit.
Broiled ham.
Toast. Rolls.
Coffee. Tea. Cocoa.

Dinner.

Consommé.
Radishes.
Roast squab. Jelly.
Mashed potatoes. Cauliflower, Hollandaise.
Waldorf salad.
Sherbet. Wafers.
Tea. Cocoa. Coffee.

Supper.

Pea purée.
Toast fingers.
Potato salad. Cream cheese.
Blueberry muffins.
Jelly.
Tea. Cocoa. Coffee.

Notes on Wednesday Menu.

This is a good time to serve a little more elaborate menu. As the salad requires considerable work, the dessert should call for very little. The supper requires a great deal of time, but it can be done long before the supper hour.

Thursday.

Breakfast.

Canteloupes.
Puffed rice. Pettijohns.
French toast.
Syrup.
Rolls.
Tea. Coffee. Cocoa.

Dinner.

Scotch soup.
Celery.
Breast of veal, stuffed and rolled.
Mashed potatoes. String beans.
Endive salad.
Marshmallow pudding.
Tea. Coffee. Cocoa.

Supper.

Broiled chops.
Baked potatoes.
Floating island custard.
Wafers.
Tea. Coffee. Cocoa.

Friday.

Breakfast.

Plums and grapes.
Grapenuts. Hominy grits.
Broiled smelts.
Toast. Rolls.
Tea. Coffee. Cocoa.

Dinner.

Clear soup.
Pickles.
Baked whitefish, tartare sauce.
Mashed potatoes. Summer squash.
Macedoine salad.
Maple mousse.
Tea. Coffee. Cocoa.

Supper.

Spaghetti a la Italienne.
Creamed potatoes. Lettuce nests.
Baked pears.
Tea. Coffee. Cocoa.

Friday Notes.

Here again the salad contains a large percentage of protein in contrast with the small percentage in the vegetables served.

SATURDAY.

Breakfast.

Peaches.
Malted flakes. Ralston's food.
Rice croquettes. Syrup.
Toast. Rolls.
Tea. Coffee. Cocoa.

Dinner.

Creole soup.
Olives.
Spring lamb. Currant mint sauce.
Mashed potatoes. Carrots, French style.
Cottage cheese salad.
Gelatin fruit pudding.
Tea. Coffee. Cocoa.

Supper.

Broiled steak. Baked sweet potatoes.
Apple fluff.
Fruit cookies.
Tea. Coffee. Cocoa.

FEEDING THE SMALL HOSPITAL

Small hospitals of from 10 to 50 beds are springing up in all parts of the country, largely with the intent to supply deficiencies in the present hospital facilities. These hospitals are built and intended to be operated by one or a few of the foremost physicians in the community. We have considered elsewhere the necessary equipment for such an institution. Let us now very briefly go into the question of feeding such a small hospital, and there will hardly be a more profitable method of doing this than to give figures of amounts of food that will be required. These figures can be stated in tables, and will perhaps, after all, be more expressive than any amount of general discussion.

Table No. 1 is a statement of the ordinary standard fruits and vegetables required by the same hospital for one week.

Table No. 2 (p. 590) covers the question of the meats that will be required for a 50-bed hospital for one week expressed in days and meals and pounds of meat.

TABLE No. 1.

FOR ONE WEEK.

Canned Fruits.

2 dozen peaches.
2 dozen pears.
1 dozen apricots.
1 dozen green gage plums.
1 dozen sliced pineapples.

Vegetables Canned.

2 dozen asparagus.
9 gallon cans peas, or
3 gallon cans spinach and 6 peas.
3 gallon cans string beans.
3 gallon cans corn.
3 gallon cans tomatoes.

Dried Fruits.

30 pounds prunes.
20 pounds dried peaches.
20 pounds dried pears.

Fresh Fruit in Season.

1 barrel apples.
2 cases oranges.
1 case lemons
1 case grapefruit.
2 crates grapes.
2 cases peaches.
1 case apricots.
1 bushel pears.
2 dozen canteloupes.
1 crate pineapples.
1 case strawberries.
1 case cherries
1 case plums.

Staple Goods.

8 bushels potatoes.
1 bushel sweet potatoes.
1 sack carrots.
1 sack onions.
1 sack beets.
1 barrel cabbage.
50 pounds dried beans.
65 dozen eggs.
70 pounds butter.

TABLE No. 2.

	Breakfast.			Dinner.								Supper.							
	Bacon.	Ham.	Fish.	Chicken.	Sweet-breads.	Fish.	Veal.	Lamb.	Stews.	Roast beef.	Squabs.	Ham.	Roast beef.	Chicken fricassee.	Ham-burger.	Steaks.	Sausage.	Lamb chops.	Oysters.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	gallons.
Sunday	5			75								10	10						
Monday . . .		5				15				30								25	
Tuesday . .			25		6			25						20	15				
Wednesday . .	5			40			12									25			
Thursday . . .		5							15		One for each patient	10	10						
Friday			20			20				10									2½
Saturday . . .	5				6			15	12					20			12		
	15	10	45	115	12	35	12	40	27	40		20	20	40	15	25	12	25	2½
						45						10	40	115					
For one week.						80						30	60	155					

Specials: 140 pounds soup meat a week.
40 pounds round steak a week for beef juice.
40 pounds shank meat a week for beef broth.

COST OF PRIVATE VS. CHARITY PATIENTS

The question is often asked, and never answered: "How much more does it cost to feed a private patient than a free patient in the hospital?"

Any answer to this question must be pure speculation, or at least relative, and based upon special conditions in the institution involved. It is no answer to compare the figures of cost for food in one of the great charity hospitals with figures for some private institution, because, in the one case, all of the expense will be based on economy, and with a view to feeding poor people who are not accustomed to luxuries—such as cheap cooks, cheap service, and little of it—cheap dishes, and other utensils, and cheap help of all kinds; whereas in the private hospital, the high order of service necessitates the employment of expensive chefs and dietitians, and expert help of various sorts, such as coffee and tea makers, pastry cooks, expensive cutlery and dishes, with a high order of service clear up to and including the head of the institution.

In mixed hospitals there is another difficulty—a part of the soup for the day will be fed to the pauper patient, if the institution is run upon a humanitarian plane, and part of it will go to the private patients. Who is to measure the exact proportion that each gets? The best cuts of the roast will go to the private patients and the less choice to the free wards. Such staples as potatoes, rice, butter, eggs, and milk will go indifferently to the private and free patients. Who is to measure the exact amount of each of these staples the two classes receive?

In other words we can only generalize, and we ought to set out upon this generalization with some fundamental propositions: first, that the free patient—who, by the way, is not a free patient at all, but who is being paid for by some generous man or woman of wealth—ought to have just as pure, wholesome, and nutritious food as the private patient who happens to be paying his own way, and that the difference in the food of the two is only in the matter of luxuries. We need not give to the free patient mushrooms, brussels sprouts, and asparagus tips; these are merely luxuries demanded by the rich, who would be much better off without them. Second, the quantity and kind of food should be based wholly upon the physical condition of the patient, whether he be a rich man or a pauper, and not upon any financial rating.

If we assume these conditions—and they are fair propositions in this day of modern philanthropy—then we have only one other comparative factor, and that the result of experiment. A rich man comes to the hospital to-day, let us say, and is shown to a private room; he is placed upon a light diet, if indeed he is fed at all, and is prepared for an operation which is performed two days later. For four or five days this patient is fed on a liquid diet—milk and a little broth; presently soft eggs and a light cereal. In the course of a week he is beginning to take substantial nourishment and is perhaps sitting up. In the meantime, his people have been coming to the hospital daily or oftener, and they want him at home; and as he is now convalescent, at the end of, say, ten days, he is taken in an automobile or even an ambulance, accompanied by a trained nurse, to a luxurious home, where all of the comforts and luxuries can be purchased, and where he can be visited as frequently as necessary by his physician. During his stay in the hospital he has had a special nurse, so that the hospital has not been compelled to furnish the floor nurses for him; as soon as he arrived at a period of convalescence, where he could partake of expensive foods or even any considerable amount of any sort of food, he is taken home. Then another patient comes to that room for ten days and returns home under like conditions; then perhaps there is a typhoid, who, as soon as convales-

cence is far enough advanced for him to partake of substantial food, is likewise taken to his luxurious home for convalescent attention. Such a private room as this, changing its occupant as frequently as we have outlined, will take care of thirty or forty patients a year at a minimum expense to the institution. The dressings, if there have been any, are no more costly than those for the pauper.

Now let us take the free patient or, at least, a bed in the free ward. The patient is brought to the hospital as in the former case, is operated upon, and gets to that stage of convalescence where he begins to eat substantial foods. He cannot be sent home, since his home surroundings are unfavorable; he has no trained nurse, and his attendants are members of his ignorant family or friends, who cannot be trusted to see that he obtains the proper diet or the proper dressings, so he must be kept at the institution during the period of convalescence, which may be ten days or even longer, until his stay has lengthened into a month, and for a large part of that time he must have been getting nourishing and, consequently, expensive foods.

In other words, the bed in the private room has cost comparatively little, because each of its occupants has gone home before his condition permitted him to become much of an expense in the matter of food. On the other hand, the occupants of the free bed have been on full diet for at least one-half, and oftentimes two-thirds, of their stay in the institution. Reasoning from this basis, it may be fairly doubted whether the maintenance of a bed in a private room will prove more costly than one in the free part of the hospital.

EMPLOYMENT OF INSTITUTION HELP

Institution help is a problem all by itself, and a problem that will perhaps never be settled. It is a constant source of annoyance and oftentimes of despair. Almost every hospital administrator is disposed to envy almost every other hospital administrator, assuming that he, and he alone, has this great, overpowering, all-pervading burden concerning help—the inefficiency of help, the extraordinary demands of the help, the dishonesty of the help, the impossibility of maintaining a discipline among the help, the wastefulness of the help; but it would seem that we are all sufferers alike in this regard, and the signs of the times indicate that the difficulties of obtaining proper help at possible prices are to grow greater rather than less, because hospital wages are not very high, and the wages of almost every class of people in this country are growing, not only out of proportion to the service contemplated, but out of proportion to the value of the help we finally obtain.

But this problem is real, and it is one that we must meet every hour of the day in some form or other, and to that end we must fix some definite policies concerning the employment and the handling of help that will promise an amelioration of the annoyances and embarrassment in proportion as we systematize our work or leave it in an unorganized form.

Asa Bacon, superintendent of the Presbyterian Hospital, in Chicago, read a very excellent paper before the American Hospital Association some three years ago concerning the wages of hospital help. Mr. Bacon went to the trouble of securing data from many of the institutions of the country, and his figures are of immense value, not so much on account of the exact salaries paid for the various help in institutions, because those salaries change from year to year, but as showing a uniformity in the wages and work of help and the variations due to local conditions in different parts of the country. Mr. Bacon's figures

are rather cold facts on a subject that resolves itself into a good deal of sentiment, and one that is tempered in a very large measure by personal equation, and we all know full well that institutions like hospitals in this country have no flat rates of payment for employees as most other kinds of business have, for hospitals are not unionized, as a rule, and we oftentimes secure the services of a most valuable head of a department at a figure ridiculously low from the standpoint of the actual value of the employee to the institution. As for instance, a pharmacist may be paid $60 a month and his living, and he will be of so mediocre a caliber that we will be compelled to go into the market and buy, at practically prohibitive prices, things that a more efficient man would make out of crude drugs, and he will know so little about wholesale prices of things and their keeping quality that he will overbuy of perishable things and underbuy of things that might well be purchased in wholesale amounts and that would keep until used, and the services of such an indifferent pharmacist as this would not only come very high to the institution, but in reality he would lose and waste for the institution very much more than the amount that would secure the services of a competent employee; so that, while the institution might save $10 or $15 or $25 a month on the services of its pharmacist, it would waste maybe ten times the amount because of his ignorance and inefficiency. And this same thing may be said of all the heads of departments in the hospital.

Trained Help.—We must take into consideration in the employment of help, especially of the higher order, not so much the salary that we must pay, but the employee's efficiency and ability to save the institution money, as well as to perform his duties in a competent and efficient manner. Very often in looking over the financial figures of an institution we will notice that the salary roll is high and the supply purchases very low, and these figures have an immense significance to those who can read between the lines.

There is no set rule for employing the higher orders of help in an institution. Once setting before ourselves the duty which we expect the employee to perform, we must look for the man or woman most likely to perform that duty in an efficient manner and then pay the salary asked.

There is no hard-and-fast rule by which we can find the help that we need. There is no source of supply of an official or recognized character. We must find our pharmacist through the drug channels of trade and through the drug journals. We must find our engineer through the unions of that craft, or we must go into the plant of some business house and hire an engineer over their heads, if we can find in such an establishment the man we think we need.

Storekeepers are born, not made, and some institutions must search continuously for some efficient employee to have care of the stores of the institution, while another hospital may be so fortunate as to keep one faithful employee all his life.

The hospital steward is a creature of the institution. He must be trained for his office, and his training must be had under tutelage of the housekeeper, the dietitian, and whoever else has to do with the use of perishable supplies which are within the realm of the steward.

There are no hospital dietitians that one can employ. There is no school of dietetics in this country that teaches hospital dietetics worthy the name.

The head of the milk laboratory is preferably a trained young woman, trained perhaps in the institution itself. She must be fairly well educated, but, above all else, she must be conscientious and honest in her work.

The department of hydrotherapy will usually be manned by Norwegian or Swedish masseurs and hydrotherapists, because the schools in those countries

give the best training, and the men and women trained in them will give better satisfaction than any others, and they will usually be faithful, permanent, and conscientious.

We have said elsewhere what we thought about the matron and her assistants.

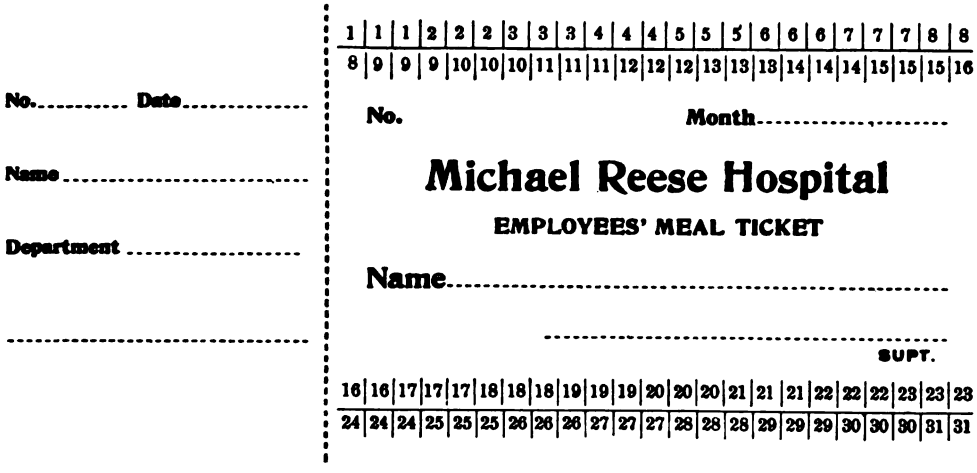
Employment of Common Help.—We are almost reduced to the necessity to secure our common help from among recently imported foreigners, especially janitors, floor men, wall washers, garbage carriers, cleaners of various sorts, and the maids. American men and women do not take kindly to menial office, and perhaps they would not do the work so well if they did, being "above the job," so to speak, from the very outset. Germans, Poles, Hungarians, and Scandinavians are the commonest available hospital help, and they do just what they are taught to do and in the way they are taught to do it. All they bring with them to a situation is their honesty or dishonesty, their industry or slothfulness. They rarely have any capacity for technical employment, and must usually learn from the ground up whatever they are expected to know, no matter how many positions they have had or how long they have been in the country. The only skill that these people seem to have as an inherent asset is their skill in pilfering, and that skill is oftentimes of so crude a character that they can be kept from practising it without very much difficulty. But nearly all these people have attained some sort of reputation for honesty or dishonesty in places they have worked, and it seems that employers of help, and especially employers of hospital help, are growing rather more particular about giving certificates of character and credentials of ability to discharged or leaving employees than they formerly were. It is rare in these days that we are deceived by employing a common helper who has come with references from some other hospital, and usually our losses in the way of petty stealing are due to our own carelessness in hiring people without proper recommendations. It is not often that these people forge credentials. They haven't the ability, and they have not a sufficient influence with a hospital administrator, or even a hospital department where they have worked, to secure credentials they have not earned.

When the housekeeper or the head of any other department of a hospital hires a new employee it should be the inflexible rule in the institution that the employee shall be taken to the business office of the institution, and put through the regular technical process of employment before he or she is permitted to go to work, and this procedure should be taken care of by the accountant or chief clerk of the institution, or by some one of discretion and experience. There should be regular forms for employees to sign, and a distinct and individual account ought to be kept with every employee, including all the letters of recommendation that the individual brought with him. These letters of recommendation should all be taken up when he is hired, and placed in the file pocket with the official papers concerning his employment. A definite contract should be signed with the individual, and this contract should set out the terms of his employment.

The form of contract should specify that the individual is employed at the pleasure of the institution, and may be paid off at any time "at the rate of" so much per month. This makes it possible for the institution to discharge an employee and pay him for precisely the time he worked. If employees are hired by the month, and are discharged during the month, the labor laws in most parts of the country will compel the institution to pay for the full month, and it is easy for one of these employees to obtain the services of a lawyer either to compel the institution to pay or to make a good deal of trouble.

In large institutions there is oftentimes a difficulty in keeping outsiders from obtaining free meals in the institution, and to this end some institutions have

adopted a form of meal ticket, so framed that the ticket can be punched for the three meals of every day in the month, ninety meals, and this ticket, with its appropriate stub, can be used as the employment card of the employee. This meal ticket is of some importance, and we produce it here:



Its use contemplates the stationing of some trusted employee at the door of the helps' dining-room for the meal hours, and the ticket of each employee is punched as he enters the room.

In the card file of employees, which contemplates a pocket for every employee in the institution, there should be a card containing all the necessary information about the employee in addition to his letters of recommendation. This card will contain the name and age, nativity, length of time in this country, previous places of occupation, with details as to time employed, his present address, or that of parents or nearest of kin. This card should also contain information about the skill of the employee in various directions, as given by himself at the time of employment, setting out his ability to do certain work, the time that he served in such work, and the like; and if, after the employment of the person, the institution will make inquiry of a sufficient number of the people named as reference or former employers, to give a fair indication of the truth or falsity of the employee's statements, the institution will be more than repaid in the long run, because there is no question that there are people about the country who hire themselves out not for the purpose of the labor they intend to perform and the wages that go with it, but with a view to the opportunities for theft, and the freedom of movement about a hospital gives a fair field to any employee who is intelligent enough to distinguish the valuable things, such as apparatus, surgical instruments, microscopes, and the like.

If the employee, when he is hired, is to have a uniform or keys or other property of the institution he ought to be compelled to sign for it.

When an employee is discharged, or leaves of his own accord, he must go to the business office of the institution to settle his affairs. Oftentimes employees leave of their own accord, and without notice, immediately after pay day, and they sometimes embarrass the institution by their non-appearance the next day. This can nearly always be obviated if the hospital has possession of the employee's letters of recommendation. Sometimes an employee merely gets drunk on the night of pay day, and after sobering up a day or two later is ashamed to return. He may have

been an excellent man, and one does not look for all the virtues in a hospital helper at $20 per month, and some of us forgive pecadillos of this sort as being one of the reasons why we can secure the services of such a man at so low a price, but the employee happens not to know this policy. However, if the hospital has his papers he is more than likely to return for them, and perhaps to go back to work again with a better understanding of things.

Most well-conducted institutions make it a rule never to give a letter of recommendation to a discharged employee, or, if the employee has been discharged for some reason other than his own deficiency or his own dishonesty or laziness, and the administrator of the institution feels that he is entitled to a limited recommendation, the facts concerning the discharge ought to be set out so that a future employer will have the advantage of whatever information there was, either for or against the employee. Naturally, if such a letter of recommendation is a handicap to employment it will not be used, and will, therefore, do no harm.

CLEANING THE HOSPITAL

The question of how the cleaning of the institution is to be performed, and whether male or female common help shall be employed, is one that settles itself in most institutions. Without any doubt, the fewer men we have the less trouble we will court. Male help of a character that will consent to scrub and mop the place is about the lowest possible order of employees. Such men are almost uniformly time servers, whose chief object is to do as little as possible for the money they receive. Some of them are more alert and of greater intelligence than others, and some hospital administrators of great experience in the handling of help are almost tempted to discharge a man without any other reason than that he has displayed more intelligence and alertness than befits his station; the philosophy behind the discharge of such a man is that one of his capacity, willing to do such menial and poorly paid work, must have some ulterior motive, and hence is not safe.

There are many large and well-conducted institutions in which men have been superseded by women for cleaning service. It is supposed they clean better and more conscientiously and they will work cheaper. In some hospitals the cleaning work is apportioned out by localities, and one man or woman is detailed to keep his or her locality clean all the time. Elsewhere the housekeeper or an assistant heads a gang that goes over the house from garret to basement, working in squads. This system has the advantage of a guiding and directing head even in the details of the work; it has one disadvantage, namely, that some parts of the house need much more attention and more frequent cleaning than others, and, where a systematic covering of all parts is done in rotation, this is not usually feasible, though in some hospitals where this system is employed a few of the worst places are regularly cleaned much oftener than the house generally, that is, the routine is broken into in the case of especially dirty places.

There is another question that frequently comes up, especially in the smaller hospitals, namely, how much of the cleaning should be done by pupil nurses and by graduate specials on service in the hospital.

We may dismiss the thought that these young women are not menials with the mere suggestion that their high ideals of their profession are not likely to be greatly encouraged if they are compelled to scrub the floors and sweep. From the purely material standpoint of dollars and cents, leaving out every sentimental consideration, there is nothing to be gained by making pupil nurses do the cleaning. It has been argued that the pupil nurses are paid no wages, while workwomen are paid,

therefore the work may be more cheaply done by the nurses. This is not true; in nearly every hospital a certain percentage of the pupil nurses are employed as "house specials," for which service the institution is paid $15 per week, or $60 per month; for that much money three workwomen may be hired, any one of whom is capable of turning out a greater amount of menial work than the nurse whose earnings for the hospital are making possible their employment. Therefore, the menial work should all be done by strong workwomen, incapable of performing any sort of technical service, even to the cleaning of the rooms occupied by the patients under the care of these "house specials." It goes without saying that the nurse should consider it a part of her duty to keep her patient's room tidy and neat once it is cleaned for the day.

THE INSTITUTION LAUNDRY

JUST why the laundry should be allowed to persist as the most perplexing and hopeless problem of institution management is not quite clear. Perhaps it is because there are no laundry consulting engineers, as there are steam and electric and various other mechanical experts, and we are, therefore, obliged to be guided by the laundry machinery makers or a not always very practical or well-informed class of laundry workers, the one avowedly interested in selling machinery and the other too often ignorant of the more abstruse rules of cause and effect about their work.

It is very certain that architects know very little about the laundry business or its requirements; their engineer collaborators usually know very little more, and the hospital manager himself has not a sufficient amount of exact knowledge to impress his views upon anyone interested in the building and equipment of the new institution, if, indeed, he has any well-defined views to advance. The result is that almost everybody concerned is agreed that the laundry is not a very attractive place, and that it ought, therefore, to be removed as far as possible from view. Who ever heard of an architect making a feature of the laundry in his plans for a new institution, or who ever knew of a board of directors to call his attention to the minor place to which that part of the institution was relegated? And thus it comes about that any dark and well-hidden hole, not otherwise available, is designated in the plans as the laundry, and the laundry machinery people are commanded to make their specifications to utilize that hole; then, when the figures look large, the board of directors will be startled by a proposition to spend so much money in such an out-of-the-way and inconspicuous place. By such logically sequential stages it transpires that the institution laundry is too small to do the work, that the quarters are so constricted the operators cannot work, and that the sanitation, ventilation, and surroundings are so uninviting no self-respecting people will remain there. Therefore, to get the best advice on the laundry subject it is advisable that the laundry be one of the early considerations; that the space it shall occupy shall be alloted early, and, to best decide on what shall be the requirements, it is best that a consultation be had between the interested directors, the architect, and representatives of the leading laundry machinery manufacturers. This conference should be held with all representatives present, and it would be found that the advice received at that time by a discriminating board would not be governed by the sole object of selling machines, but advice that would give the best information possible to receive.

Let us see just what the laundry means to the institution, without taking any account whatever of the esthetic side that contemplates clean and dainty bedclothing, neat, comfortable looking patients, and tidy interns, nurses, and orderlies. According to a very conservative calculation, upon which we shall dwell more at length hereafter, the average linen supply per patient will be as follows, with its approximate cost in an acute disease general hospital having medical, surgical, obstetric, children's, and private room departments:

20 sheets at $6 per dozen	$10.00
3 spreads at $1 each	3.00
20 cases at $2 per dozen	3.33
4 gowns at 25 cents each	1.00
20 face towels at $2 per dozen	3.33
4 bath towels at 25 cents each	1.00
71 pieces	$21.66

This means that each bed must be allowed at least $20 worth of linen, without counting upon any reserve stock, and at least two pairs of blankets, worth, roughly, $6, or a total of $26 worth of bed furnishings. In a hospital of 100 patients the total value of the linen in constant circulation would be $2600. Now add, for purely speculative purposes, the clothing and bedclothing of executive officers, interns, nurses, and whatever help there is to lodge, and we have some idea of the value of the goods that must go through the laundry each week.

In the laundry operated upon the highest plane of economy consistent with efficiency these goods will last an average of one year. It is not the use of goods that wears them out, but their abuse in the laundry, and if the work is indifferently done by incompetent and careless people the goods will not last more than half so long; there will be an expense, therefore, of an entire new supply every half-year. These figures can only be given in the rough and in a wholly speculative way, but the point is sufficiently made to indicate the difference between a good laundry, well operated, and a poor one.

Laundry Problems.—Aside from the general problem of the laundry and its many-sided phases, not capable of specific reckoning, there are a few questions that present themselves definitely, and we may discuss them briefly in some order:

(1) Is the laundry work more advantageously performed in and by the institution itself, or can it be better done by outside parties regularly operating the laundry business?

(2) Wherein does the hospital laundry differ from other laundries that it need be considered from different aspects?

(3) If it is agreed that the institution shall do its own laundry work, what capacity and character of machinery is required to perform a given amount of service?

(4) What is the technic of the institution laundry for various kinds of fabrics and garments?

(5) How shall the laundry goods be handled into and out of the laundry, checked, and distributed?

Home or Commercial Laundry.—The question of whether we shall do our own laundry work in the institution, or send it out to a concern that makes a business of doing laundry work, is not new. Some hospitals are to-day having their laundry work done outside the institution. The cost of the two methods is about the same in both places, and, barring a favorable or unfavorable condition here or there, the cost may be flatly stated as 1 cent per piece for purposes of discussion, whether it be done at home or abroad.

If the laundry is sent out, we avoid the necessity to have additional rough and undesirable people about the premises who are difficult to handle. It is always hard and oftentimes impossible to obtain the services of a competent, sober, and tractable head laundryman; the machinery of the laundry is complex and needs a great deal of attention, especially in the hands of more or less careless and inefficient people; the wear and tear on the machinery is very great in the hands of a force of this sort, and, unless there is constant watchfulness on the part of some one in authority, the wash work will be indifferently done, many articles are likely to be

stolen, many torn and otherwise destroyed, the bleaching processes will often be overdone, and there will always be discomfort and annoyance. It is well to remember here, however, that it will be money well invested to engage the services of a competent head laundryman, paying him for the service on an equal basis of what he could obtain holding a similar position in a commercial laundry. With a good head to the department, the troubles of the balance of the department will be greatly reduced.

It may be well questioned whether the fabrics will be better cared for in the commercial laundry than at home. There will occasionally be a better accounting and fewer pieces will be lost in the commercial laundry, because very much more care will be taken in the counting at home, but commercial laundrymen are shrewd people at their business, and they are disposed to wash goods at the least possible cost of labor and material, and their efforts to obtain a good appearance in this product often leads them to extremes in the use of bleaches and starches. One can never be sure of sterilization in a commercial laundry, hence there is some danger in the use of the articles that have been used in the infectious parts of the institution and that may have escaped the disinfecting processes before going to the laundry. The laundry process, however, whether home or at commercial laundries, requires the boiling of clothes to thoroughly cleanse them, and, even if bacteria should remain after the washing process, the drying and ironing under high temperature would almost assure perfect sterilization. The commercial laundry is usually at some distance from the institution, and quick returns cannot always be had.

So that balancing up the matter from every view-point there is hardly a question that the advantages lie largely on the side of the home laundry, for at home there is a better control even at the expense of annoyance and sustained effort, and, as we shall see hereafter, perhaps we have not come to an era of efficiency in our home laundries that, if practised in architecture, equipment, and operation, would very much more than settle the question.

Some good hospital managers will not concede the advantages of the home laundry. The Toronto General Hospital has been happily situated, for instance, in having at convenient distance a reformatory for females, with which it has been able to make laundry arrangements to supplant an unsatisfactory and too costly service with a commercial laundry. In their new hospital, however, a home laundry of modern equipment is contemplated. Dr. Henry M. Hurd, of Johns Hopkins, finds little to choose between the two methods, excepting on the score of the better control at home. E. W. Morris, of London, in a recent prize essay on hospital economies and practices, doubts any economy or advantage in the home laundry, but suggests a "moderate provision for badly soiled linen."

Character of the Hospital Laundry.—The hospital laundry is made up of an infinite number of articles covered under a great many heads, coming from a great many places, after having been used in vastly different ways, and soiled all the way from a mere wrinkling to stainings and acid burnings that can never be removed, excepting with the knife or scissors. The hotel laundry is vastly simpler, the units of the wash being limited there to the bedclothing and table-cloths—that is sheets, spreads, and pillow cases, and table-cloths, towels, and napkins—and the same may be said in a lesser degree of the sanitarium and special hospital in which only one or two classes of patients are received.

In the general hospital there are the various departments, medical and surgical, free, part pay, and private accommodations, and the well people, interns, nurses, and administrative officers, and the help, and all this must be again subdivided into bedclothing, table clothing, room clothing, such as curtains and dresser tops,

couch covers, and screen cloths, and all this must again be divided in the laundry, according to the processes involved in washing the different fabrics and garments, so that there is infinite detail and a vast division in the hospital laundry.

Capacity of the Laundry.—We are now approaching a phase of the laundry problem that is the subject of more difference of opinion between hospital administrators than almost any other question that pertains to institution management, and one in which by reason of the difficulties surrounding definite calculations, one may obtain almost any figures of capacity and cost. It is not the purpose of this book to quote from the literature in any direction, but to give, so far as may be, the consensus of opinion, based on the expressions of competent writers and, in the last analysis, the experience and judgment of the author.

Other things being equal, the capacity of the laundry will depend on the character of the institution. First, the kind of patients taken care of, whether they be patients likely to use a great deal of laundry goods, such as the children's department, maternity department, and the surgical sections; and quite as much will depend on the intent of the institution as to cleanliness and care of patients. In some institutions a pair of sheets is made to last a week in the free wards, and surgeons in the operating-rooms are compelled to wear an operating gown for a morning's work without change; in some institutions towels are distributed most begrudgingly, the nurses being compelled to use a bath towel for a week and a face towel for half as long. In some institutions free patients are bathed every day and the bedclothing is changed as often. Private patients are given all the linen they want, which is vastly different from the amount they actually need, and interns and nurses and administrative officers have bath towels and face towels daily. In some places the nurses wear their uniforms for a whole week and their aprons for three days, while in other institutions they are given three uniforms a week and aprons every day. We shall, therefore, not attempt to fix the capacity of the laundry in the institution that is run by a guiding star of economy rather than that of efficiency, nor shall we be obliged to calculate for the institution that is prodigal with its laundered goods. One cannot fix any definite limit to the bedclothing and body clothing of patients in the hospital. One surgical patient may need ten or even twenty changes of sheets a day, and in the well-conducted hospital will have them. Babies that are properly cared for must have sometimes as many diapers as one every half-hour. But we can fix somewhat a fair average of the laundry work in the well parts of the institution. The dining-tables ought certainly to be changed once every day and the napkins as well. It is the custom in many places to change the interns' and nurses' sheets twice a week, making the top sheet of to-day the bottom sheet of the three days hence. Pillow slips ought to be changed three times a week, because the oils in the hair soil them. Interns' white uniforms are difficult to launder, and should be done by hand, although a large percentage of the work can be done on body ironers, which would leave hand work for the finishing only. Four pairs of trousers and three coats a week are quite necessary if the young men are to make a neat and businesslike appearance. Undergraduate nurses must have two uniforms a week, and there must be no niggardliness if they need a third. Some nurses are much neater than others and take better care of their clothes, and some of them require more uniforms because of the nature of their work, as, for instance, in the children's department. In the surgical departments and diet kitchens the clothes can be protected by long aprons, dressing-gowns, and operating-room garments; they should have at least one apron and clean cuffs and collars every day and underclothing twice a week. Special arrangements should be made for sanitary napkins for the nurses. There is on the market a pad, made

of absorbent cotton and gauze, that costs in large quantities about 1 cent, and if the nurses are provided with these it will contribute to lessen the amount of laundry in towels and the regular napkins, and will contribute even more to the self-respect of the nurses who are thus provided.

Head nurses who wear white uniforms should have three a week if they are to be a credit to the institution.

These proportions make up, with variation here and there, the chief laundry articles in the best-conducted institutions in this country, and it is upon such figures as these that we must base our calculations as to the amount of work the laundry ought to be asked to perform. Also, when we figure laundry work, we must figure per bed of the hospital—that is, according to the number of patients—it being assumed that each bed requires the attention of a given amount of service of other people—nurses, interns, mechanics, and the common help—and in most institutions this is figured at one well person for one patient. For instance, if there are 200 patients there will be about 400 people in the establishment for whom the laundry must be operated. Of course, it is well understood that the proportion of well people to the number of beds grows with the size of the institution; that is, a hospital of 50 beds may require 25 people to serve it. When the size of the hospital grows to 200 beds, the number of help will be about equal, and beyond that the number of well people will exceed the number of beds.

Very much might be written concerning the number of pieces per patient allowable under modern hospital conditions where both patients and well people are accorded adequate laundry service. There is much literature on the subject, some of it not very recent, some of it wholly unreliable or taken from seriously questionable calculations, and some of it presenting figures of actual accomplishment so ridiculously low as to be unworthy of consideration. It cannot profit us, therefore, to dilate upon such statistics, and we shall content ourselves with a very brief review of the figures of two institutions, one the Mount Sinai Hospital in New York, conceded to be exceptionally well conducted, and the other the Michael Reese Hospital in Chicago, where it may be stated without offense a serious effort is made to give a high order of service, and in which the figures of accomplishment have been faithfully gathered.

At Mount Sinai the figures taken for the purposes of this section were as follows:

Medical pavilion (150 beds)	12,000 pieces per week.
Surgical pavilion (150 beds)	15,000 " "
Private patients (40 to 50 beds)	6,000 to 8,000 pieces per week.
Children's pavilion (72 beds)	8,000 pieces per week.

Dr. Goldwater, in his estimates so kindly prepared, carries his figures to the well people in the establishment, showing a total of 70,000 pieces turned out of the laundry per week, or 160 pieces per patient, not per person, or nearly 23 pieces per patient per day.

In the Michael Reese Hospital the figures are taken for a period when there were 290 patients per day, and well persons numbering 310, of whom 110 were nurses, 20 interns, 20 executive officers and dependents, 10 orderlies, and 40 help, mostly maids, the balance of the help attending to their own laundry. Of the patients, 62 were children, there were 3 cases of obstetrics per day, 37 private-room patients, and the balance were about equally divided between medical and surgical, with an average of 15 major operations daily. For this period the laundry amounted to an average of 37,000 pieces, running slightly more some weeks and less

at other times. This gives an average of 127 pieces per patient per week, or about 18 per day. When it is considered that more than 100 of the help had their laundry done elsewhere the actual work per patient will be somewhat increased, making it closely approximate that of Mount Sinai Hospital. We may feel justified, therefore, in saying that 20 pieces per patient per day is a fair average for the modern hospital.

Laundry Machinery.—The size and character of machines needed in the laundry will depend very much upon the makes of the machines and the methods employed in the washing processes; in some laundries each washerful is given a thorough rinsing with cold water in the washers in motion, for the purpose of loosening the soluble dirt before the hot water and soapsuds are put in, and in some laundries the changing of the washerful requires a great deal more time than in other places, but it may be fair to calculate that a washer will be at work half an hour and stopped during the changing process for fifteen minutes; that is, a washer will wash its capacity of clothing every forty-five minutes.

Washing machines are standard, being of the revolving and cylindric type, and, indeed, all laundry machinery is made in standard sizes and of standard types. Not very much is to be said about washers, excepting that the smaller the units the more convenient will they prove in the varied work of hospitals. In the larger institutions it is well to have one or two large washers for the heavier flat work, like sheets, spreads, slips, and table-cloths, and smaller machines for most of the other stuff. These smaller washers are 36 inches in diameter and 48 inches long inside the cylinder. Those made of metal, mostly brass at all points, that come in contact with water, are by far the most economic, though the first cost is nearly double that of the all-wood machines. Wood has a great tendency to pulp and soften under the combined action of heat and the various chemicals, such as soap, soda, and acids, and wears out so quickly that it is in no way comparable to the machines made all metal. A while ago there was complaint that the metal parts, especially the lighter brass of the cylinder, would sometimes crack or break, leaving sharp edges to tear the clothing, but this defect has been remedied in the modern washers and the complaint no longer holds. Yet a small washer, of about half the capacity of the above size referred to, is a requirement of every institution for handling the extremely dirty pieces, such as kitchen cloths, etc.

The flat-work ironer is the most important item of machinery in the laundry. As the ironer has capacity, so the laundry will have capacity or the want of it, and one of the commonest mistakes of those charged with the equipment of the institution is in the purchase of an ironer having a capacity inadequate to the work to be done. Take, for instance, the 100-inch three-roll ironer of the Hagen type, a most formidable looking machine, one that has a capacity to move at the rate of 14 feet per minute, and it costs about $1000. If it is crowded beyond its capacity it will not iron the clothes properly and will not dry them. Besides this, the Hagen type of ironer seems not to be planned on logical principles, since its action is based on a dragging motion of the goods through rolls that work in hollow grooves, cogwise; this dragging motion has the effect of stretching the fabric, and when the rolls or grooves or both become hard, as they do, the goods will be handled roughly and will eventually tear apart, especially at the seams.

The next size of ironer—that is, the four-roll machine, 100 inches wide—covers a moving surface of 40 feet per minute, and will thus iron more than three times the amount of clothing that will be done by the smaller machine, and, moving faster as it does and with more than double the surface, the drying out is accomplished quicker, and hence the ironing is much better performed. This machine

costs about $1800, but it is well worth the difference in price to those who can use that size of machine.

The newest type of ironer, and that which seems destined to supersede all others, is the rotary machine, composed of a large steam-heated cylinder and with a series of smaller padded rolls set at equal distances about it, and fixed to revolve each on its own axis in consonance with the larger cylinder. So important is this principle of ironing clothes that a line drawing is presented showing the mechanism (Fig. 196). This type of machine is not peculiar to any one company, but is made by the two principal ones, and is coming into common use. The better machines of this type have cylinders 48 inches in diameter by 100 to 120 inches in length, but all manufacturers make machines with smaller diameter cylinders, the general principles of which are virtually the same as the larger machine, and which make it possible for the smaller institutions to be provided with a cylinder type of machine that will meet their needs and purse.

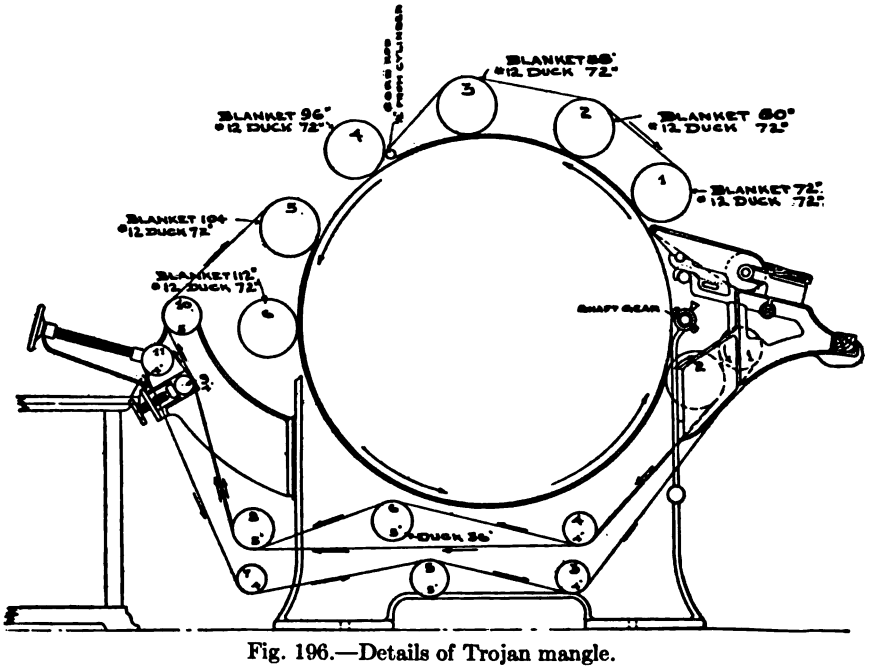


Fig. 196.—Details of Trojan mangle.

Electric Versus Gas Irons.—A great many of the clothes must be ironed by hand, and electric manufacturers have been insisting for some years that electric irons are par excellence, the most advantageous for use in the laundry, the chief reason being, to their way of thinking, that the operator does not have to stop to change her irons as she proceeds. This process of reasoning does not work out in actual experience, for the reason that institution laundries do not give as much attention to the uniform dampening of their goods, therefore endeavor to iron goods that are too wet for practical use with electric irons. Under these conditions it is impossible to keep an electric-heated iron hot enough to do constant, steady work. The dampness of the cloth cools it far more quickly than the electric current can heat it; there is the other extreme, of course, which is the main reason why manufacturers do not put in a sufficient amount of electric resistance to keep the iron at a proper temperature; if the iron is so built that it will keep sufficiently hot under condi-

tions as they prevail in a large laundry, where the women are expected to keep the iron on damp cloth all the time, then that same iron would burn up goods in the hands of the average housewife who is doing her home work with an occasional stop. There may come a time when some sort of electric device, in the nature of a thermostat, can be put into laundry irons to keep them at exactly the right temperature, but until that time is come electric-heated irons must be assumed to be entirely out of the question for the hospital laundry. The old-fashioned 6- or 7-pound hand-iron has not been improved on.

A good deal of the laundry work must be done on body ironers, such as starched shirts, interns' and nurses' uniforms, and there has been some discussion as to the relative merits of electricity and gas for heating these machines. Those of us who have tried both kinds are quite satisfied that gas-heated body ironers are the best, and electricity is incapable of giving the right temperature, for the same reason that operates in the case of hand-irons; if the operator is busy, and has the damp garments constantly against the iron, it will be too cold to do proper work, and, on the other hand, the fabrics will be burned if the work slows up or if the goods are dry when they are being ironed.

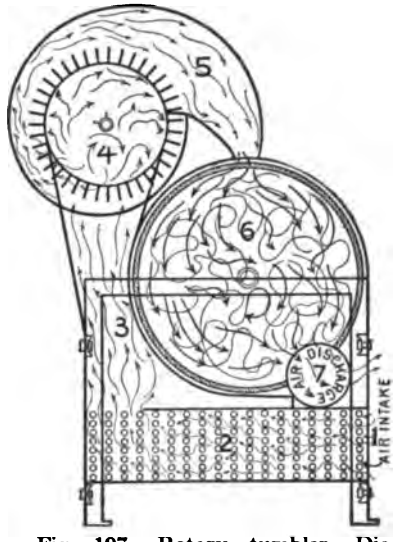


Fig. 197.—Rotary tumbler. Diagram, showing circulation: 1. An intake; 2, steam coils; 3, air passage to fan; 4, ventilating fan; 5, air passage to tumbler cylinder; 6, tumbler cylinder; 7, damp air discharge.

For all these smaller machines the manufacturers are working toward steam-heating devices to replace both gas and electricity, but steam-heated machines cannot be brought to the high temperature with electricity, to say nothing of the higher temperature of gas, consequently these machines, from a standpoint of saving of electricity or gas, will be desirable, but not from a standpoint of satisfactory service, for it will take much longer to do the work on the same classes of goods with steam for heat. Where electricity is available for other purposes in the institution it would undoubtedly be cheaper to use than gas, at average prices, but for its inefficiency as indicated above; but steam is also always available in the laundry, and will prove far cheaper than either if mechanism can be developed to employ it. There is a new steam-heated body ironer on the market that has arrived at a commercial stage of development, but its capacity is 20 per cent. less than the same type of machine would be heated by electricity, and 33⅓ per cent. less than heated by gas. Tucking, fluting, and edging devices are too small to admit of steam-coil heating.

Reverting to the body ironers, the best form is that known as the single-tread reversible type, because it swings with one motion and permits the operator to use one foot for supporting the body, and is consequently easier to handle, giving the operator practically nothing to do but attend to her garment.

The Laundry Driers.—The driers are of importance. The ordinary sectional driers will be used, of course, for most goods intended to be hand or body ironed, but for garments that are to be returned unironed, such as operating-room gowns, visitors' coats, underwear, bath, massage and roller towels, bags, and rags, the

so-called "dry-room tumbler" or rotary steam-coil drier is much better, will save time, and bring the articles back in far better condition. This drier is also used for drying articles intended to be ironed, and that have been starched in machine starchers. This double process of starching is an improvement over the washer starching as it saves a double extracting process, and likewise saves the time necessary to hang in the sectional driers and to dampen for ironing. As this rotary drier is a special piece of machinery, not very commonly understood in principle, it is reproduced in Fig. 197.

Wringers which the laundry machinery manufacturers call "extractors," made to revolve at a high centrifugal speed to extract the superfluous water, is a very important item in every laundry. On flat pieces, such as sheets of single thickness, a good extractor should remove in fifteen minutes' running time 66⅔ per cent.

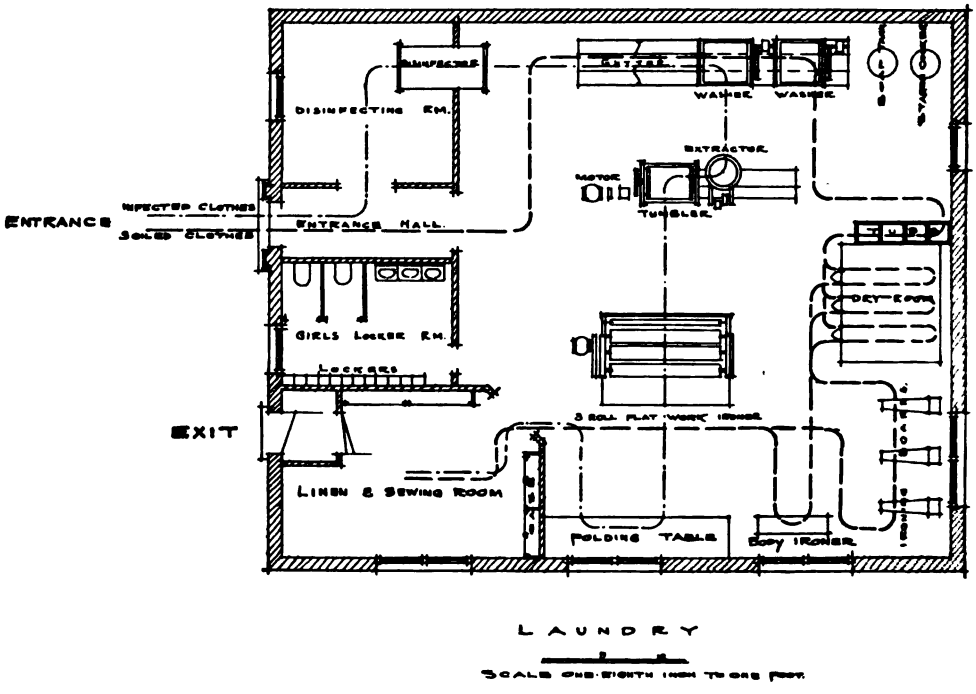


Fig. 198.—Plan for 100-bed laundry; clean clothes never cross an infected trail.

of the moisture, leaving 33⅓ per cent. to be taken out in the ironing process. On such pieces as toweling it should remove about 60 per cent. of the moisture, and it will be understood that unless this moisture is removed in the extractor the capacity of the ironing and drying machines will be that much retarded. The extractor is located in the washing department, is operated by the same men who do the washing and extracting, and consequently sufficient machines of the proper kind should be installed to see that this percentage is maintained, for if the removing of this superfluous moisture is left to the ironing and drying machines it means additional expense for help to feed the goods into the machine, to supply steam to overcome this moisture, and diminishes the capacity of both the ironer and dryer, making it necessary to give longer time for each piece to be dried than would be necessary through proper extraction.

Space for Machinery.—There is hardly a laundry in the country that has adequate space in which to perform the work of which the machinery is capable; there

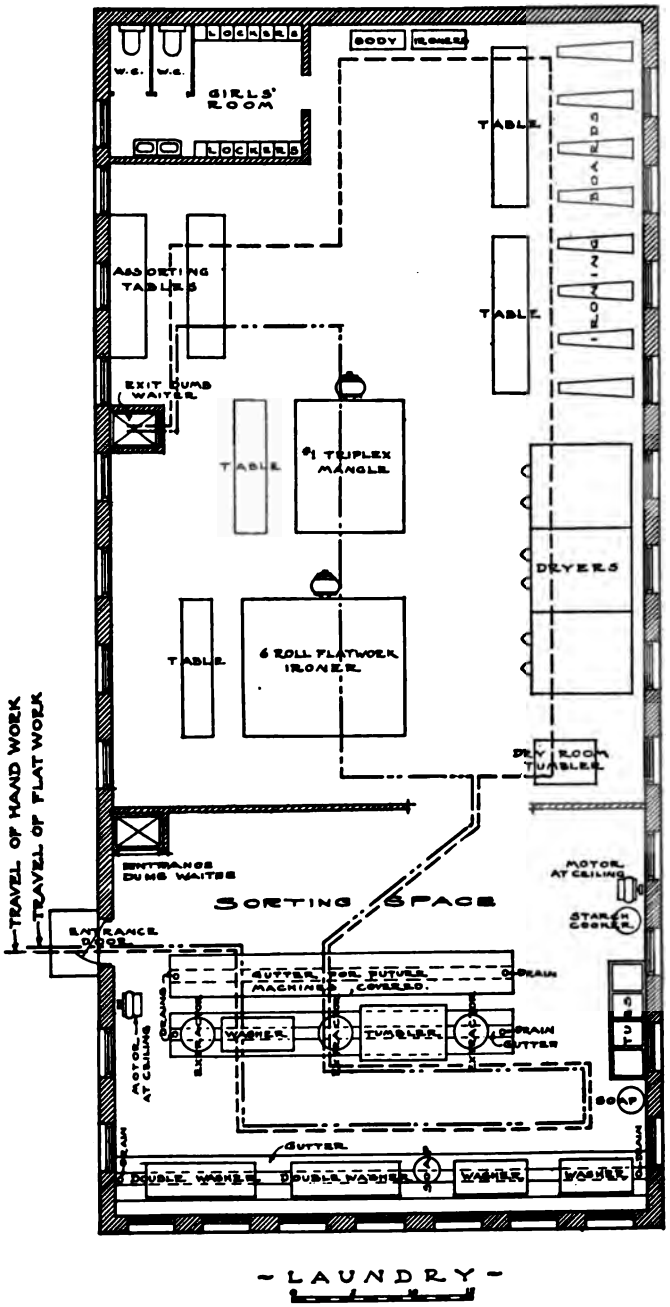


Fig. 199.—Floor-plan for large laundry. Everything enters one door, makes a complete circuit of the room without crossing an infected trail.

is never enough room for the help to move about and do the work. Very few people at the head of institutions give very much thought to the laundry, and they build

almost everything first, and expect the laundry to occupy space that is not adequate for anything else—some basement room, or a half-story of the power house, are usually considered good enough for the laundry. The laundry ought to occupy one of the most select positions in the whole establishment. In the first place, the help in laundries are entitled to some decent consideration in regard to their health and the conditions under which they labor.

There is a constant atmosphere of vapor in every laundry, due to the drying out of wet garments, and the steam and hot water from the washers and driers. The floors of the modern laundry are usually of concrete, and are made so that there are runways for the water into the sewers at different points, and an immense amount of evaporation goes on from these runways also. It can hardly be called a healthy occupation when people are asked to work in an environment of cold vapor. Therefore, the ventilation of the laundry ought to be better than that in any other part of the house, and it ought to be an artificial ventilation, so that there will not be constant drafts from one side of the room to the other that will chill the workers, whose clothing will be damp at best.

A very fair calculation of space for the laundry figures out at about 10 square feet per bed of the institution. If there is a greater amount of space than this available it would be advantageous, and a good many hospital administrators insist upon 12 feet. As a matter of fact, take the hospital and hotel laundries all over the country, and they will not average more than 5 or 6 feet of space under this calculation, which is one reason why laundry work is so indifferently done, and why the conditions in the laundries are so bad.

The conveniences for washing make it necessary that the machinery shall be installed in certain ways, and that there shall be a certain arrangement throughout. The accompanying plans illustrate the ideas of some practical laundrymen, working in conjunction with hospital architects and manufacturers of laundry machinery. These plans contemplate two different sizes of plants, made for the purposes of this section by the Troy Laundry Machinery Co. in conjunction with the author. The figures, sizes, and conditions have been carefully edited by the author, the architect, and a competent laundryman jointly, and it is believed that they will be found to represent actual requirements for the general hospital of the capacities given. Those who have special conditions, as, for instance, fewer units and larger amounts of each, may be able to use one or the other of these plans, making the proper changes.

Arrangement of Laundry Space.—All laundry goods must be taken through one entrance and out another, so that no clean linens will come in contact with the trail of soiled goods. Figure 198 shows such an arrangement for a small laundry, and Fig. 199 shows a floor plan for an institution of 300 or more patients. In both illustrations an attempt is made to show the direction of travel of flat work and hand work separately.

Laundry Rules.—It will not be advantageous to go into questions of detail in regard to doing laundry work, but there are a few fundamental points that might be well formulated into general rules:

(1) All water for laundry purposes should be filtered, and the character of the water should be well known; if it is hard, a suitable softener should be used in the same way that chemicals are used to prevent scale in boilers. Provision should be made at the very start for the supplying of abundance of hot water, and the same maintained at a temperature of at least 180 degrees; this water is generally provided in abundant quantities by the exhaust from the power-plant engines. By having hot

water of the above or greater temperature it eliminates to some extent the use of live steam in the washing machines themselves, which, on account of this pressure and force, is injurious to the linen. There is an established law in England which prevents a public laundry from operating washing machines having steam pressure of more than 15 pounds to each washer, and should a customer be able to prove that a higher temperature was maintained he could sue and recover for damages to his linen, and high-pressure steam blowing into the washing machine will damage the goods. In addition, it has a tendency to set the soap and other ingredients in the goods, which soon has a tendency to turn them gray, therefore, a very important part of the laundry should be an abundance of hot water at a high temperature.

(2) To minimize the care with individual motors for each unit or machine required in present-day practice it is advisable that the equipment, particularly the washing department, be operated from a main driving shaft by belts from shaft to power pulleys on each machine. On larger machines, such as flat-work ironers and rotary driers, the individual motors are best, as these would not be working under the severe strain or conditions that they would be in the washing department on account of the heat, steam, moisture, etc. The laundry machinery manufacturers, however, are bringing to perfection gang drives in the wash-room, by which shafting, that will operate these machines, is a part of the machine, and can be connected in such a way as to make a great saving of space and eliminate the use of belts, with the exception of one main drive, which can be of double-thick belt of the heavy grade.

(3) Body ironers will give a higher efficiency if heated by gas, and hand-irons by gas stoves made for this purpose, if these can be properly installed. Collars, cuffs, and shirts can be ironed on machines built for that purpose, and a machine known as a combined ironer, having interchangeable surface boards for collars, cuffs, and shirts, is best for the purpose, as this machine is inexpensive in comparison with individual machines for each class of work, and in the average hospital laundry is in use but a short period of each day.

(4) Each piece in the bags of individuals must be plainly marked, either with indelible ink or with a tape sewed into the piece containing the worked-in name. Indelible ink should be purchased of a laundry supply dealer which does not require a hot iron to set. This is a common fault with hospitals. Goods found not to be plainly and indelibly marked at the time of sorting should be thrown aside without being laundered. Torn articles discovered at the time of sorting should not be laundered.

(5) Each individual bundle or bag should be tagged on the outside, and this tag should contain a list of the garments within, to be checked from by the sorter. If the list is found to be incorrect, the articles should be returned to the bag and the bag returned to the owner for correction.

There should be separate days for doing the laundry for each class of residents in the institution, and this rule should extend to the time at which the bundles should be ready for the linen collector. If the bundles are not ready on time they should be refused when presented. Arrangements can be worked out so that the delivery of clean linen and the collection of the soiled linen can be made at one

trip, but care should be taken that infected goods are not brought in contact with goods that have been cleansed. Complaints concerning lost or damaged articles should be made at once in the main linen room. If complaints are not given immediate and satisfactory attention the matter should be referred to the superintendent of the hospital.

The wash of executive officers of the institution should be done entirely separately. The interns' and the nurses' wash should be done separately.

All stained and badly soiled goods should be done separately, but care should be taken to see that all infected articles have been sterilized to meet the demands of the laboratory of pathology before putting them into the washers, because the usual washing process cannot be counted on to destroy harmful bacteria.

It will be advantageous to treat each ward unit separately, so that each may have its own supply marked in detail, according to its regular designation in the hospital. In this way head nurses can be held to account for continued staining and tearing. If each nurse has a separate supply she will take an interest in keeping it in good order, but all soiled linens from all parts of the institution should be collected and checked by a person or persons regularly employed for that purpose, and duplicate checking lists should be kept as a bookkeeping account with each department in the hospital. Clean linen should be checked into each department in the same way and by the same people. According to this plan, the only linens that would go to a central linen room would be table linen, roller towels, and such articles.

A minimum of soda and bleach should be used with colored goods to avoid fading. Tepid water only should be used in washing nurses' colored uniforms. Flannel underwear and blankets should be washed with a mild, absolutely neutral soap, and in either cold or tepid water, but the temperature of the water must never vary during the process. These flannel goods should be washed quickly, as continued rolling in the machine tends to shrink woolens. Ward linens should be sorted carefully before going into the washers, so that the badly soiled and stained goods will not go into the washers with those only slightly soiled, and these badly soiled goods must be treated by hand before going into the washers.

All ward linens must have a five-minutes' rinse in cold water and soda in the washers before the steam and soap are added.

Goods must be thoroughly rinsed with water before they are taken from the washers, else there will be a tendency to turn yellow.

Ward linens should be bleached not oftener than once a month, and great care should be taken to see that the bleach is in thorough solution before using.

Table linens must be washed separately and bleached once each week. An occasional oxalic bath should be given, but a thorough and complete hot rinsing should follow to avoid injury to the goods by the acid.

Sectional dry rooms may be used for all starched clothing, but operating-room coats and gowns, patients' bed gowns, and other articles that are not to be stiffened may be dried more advantageously in rotary driers, as the revolving motion will serve to prevent wrinkling and dry more uniformly.

Linens should never leave the laundry until thoroughly dry, nor should the linens be in constant circulation. There should be plenty of reserve supply, so that clean linens may rest on the shelves for at least one-half the time, and this will serve the double purpose of meeting the emergency of a possible breakdown in the laundry, and to insure against that physical agent not well understood in detail, but recognized in everything usable from people to metal, and which we call fatigue.

Cost of Laundry Work.—Figures of cost, even for commercial laundry work, are extremely difficult to obtain, and a careful search of the literature and confidential inquiry of the laundry machinery makers have failed to discover any figures worthy of credence. In the Michael Reese Hospital very careful data have been kept for one year, and the subjoined tables give the results which may be taken as accurate for that institution. No two institutions will work under exactly the same conditions, and hence costs differ, depending partly on the specific economics practised, the conveniences of equipment and operation, the character of the work, the amount of hand work, and the efficiency of the performance.

The Michael Reese Hospital is a general hospital, having at the time of this test work a surgical department of fifteen major operations per day, a medical service of about 50 patients, a gynecologic service of about 25 patients, a children's hospital of 65 beds, and a maternity service of 3 cases per day. There were 110 pupil nurses, 12 head nurses, 20 interns, and about 160 common help, some of whom did their own laundry work. The average total number of patients for the period was 290 per day.

In the laundry there were 15 women employed, 1 male helper, and a head laundryman.

The machinery consisted of:

2 large washers.
2 medium washers.
2 extractors.
1 Triplex 100-inch 3-roll ironer.
1 gas-heated body ironer.
2 sectional driers.
1 25-gallon starch kettle.

The power was taken from the general plant of the institution, aggregating 600-horsepower boiler capacity in three boilers, two of which were in use, the other being held in reserve. The cost of laundry power included the pro rata cost of operating the plant including everything. There was no cost for water, as hospitals get their water from the city free.

Number of pieces turned out for 290 patients per year		1,924,000
Number of pieces turned out for 290 patients per week		37,000
Number of pieces turned out for 290 patients per day		5,286
Number of pieces turned out for 1 patient per day		18 +
Cost of Material:		
Soap	$1071.00	
Starch	181.50	
Soda	135.00	
Sundries	106.74	$1494.24
Cost of Labor and Board:		
Wages of help	$5417.83	
Board of help	2171.50	$7589.33
Total cost of laundry for 290 patients per year		$10,090.81
Total cost of laundry for 290 patients per day		27.645
Total cost of laundry for 1 patient per day		.095

Total cost per piece $0.0052, or 52 cents per hundred.

Percentage of Cost Itemized:

Labor	$53\frac{7}{10}$ per cent.
Board	$21\frac{6}{10}$ "
Supplies	$14\frac{8}{10}$ "
Steam	$5\frac{4}{10}$ "
Electricity	$4\frac{1}{10}$ "

Cost of Electric Power:

Average amperes	55
Average volts	222
Average watts per hour	12,220
Watts for eight hours	97,760
Kilowatt hours	98
Cost per kilowatt hour	$0.0133
Cost of electric power per day	1.1433

Cost of Steam Power:

Steam used on washers	19.5 H. P.
Steam used on ironers and dry rooms	47.0 "
Steam used for heating water from 70° F. (6000 gallons)	120.0 "
Total	186.5 "
Cost of steam per H. P.	$0.0086
Cost of 186.5 H. P. per day	1.6163

One of the results of the careful examination of laundry figures cited here was the discovery that high-pressure steam for water heating was extravagance and waste. The steam figures should not have been more than 10 per cent. of what they were, and the installation of an adequate heater, at an expense of $500, in which nothing but an exhaust steam was employed, would have cut this item of cost to one-tenth of that quoted. Indeed, since all surplus exhaust steam is wasted, the utilization of such surplus for heating the laundry water would cost absolutely nothing. It is in such items as these that laundry economies are possible.

Handling the Linens.—If a definite system of checking of goods intended for the laundry can be utilized, so that we may know at all times exactly the location and distribution of the supply, more than one-half of the difficulties attendant on institution laundry work will have been solved, and if a bookkeeping system can be established, so that a constant vigilance can be maintained over every section of the institution at all times in regard to the laundry supplies, the laundry will not be the bugaboo that it has been, and will continue to be, to most of us.

An adequate checking system presupposes arrangements in the architecture of the building that will lend themselves to such a system. So important is such a system regarded that an attempt has been made to illustrate the circulation of the laundry supply in Fig. 200.

It is intended in this illustration to show the journey of an article, beginning in the main linen room of the institution to the auxiliary linen room of the department in which it is to be used; from there to the bed, from the bed to the soiled linen bag, thence to the truck, to the elevator or chute, thence to the counting-room at the bottom of the house, illustrated in the section on Equipment elsewhere, from the counting-room to the laundry, and thence back either to the main linen room or to the supply rooms in the several departments of the institution.

To make this system comprehensive and workable there should be a carbon-copy checking list. The list should be different for each department of the institution, and each one should contain all the articles that may by any chance be sent from that department.

The soiled linens from a department may be gathered by the laundry collectors in the large laundry bags that are used as linen receptacles on the wards or in the slop-sink rooms. These bags are taken to the counting-room, and the list book turned over to the counters. The various articles are thrown into their several bins in the counting-room from a central table, this equipment being shown in the section on Equipment. The units in each bin are then counted, the number of sheets, spreads, cases, towels, and so on are checked on the list. The articles

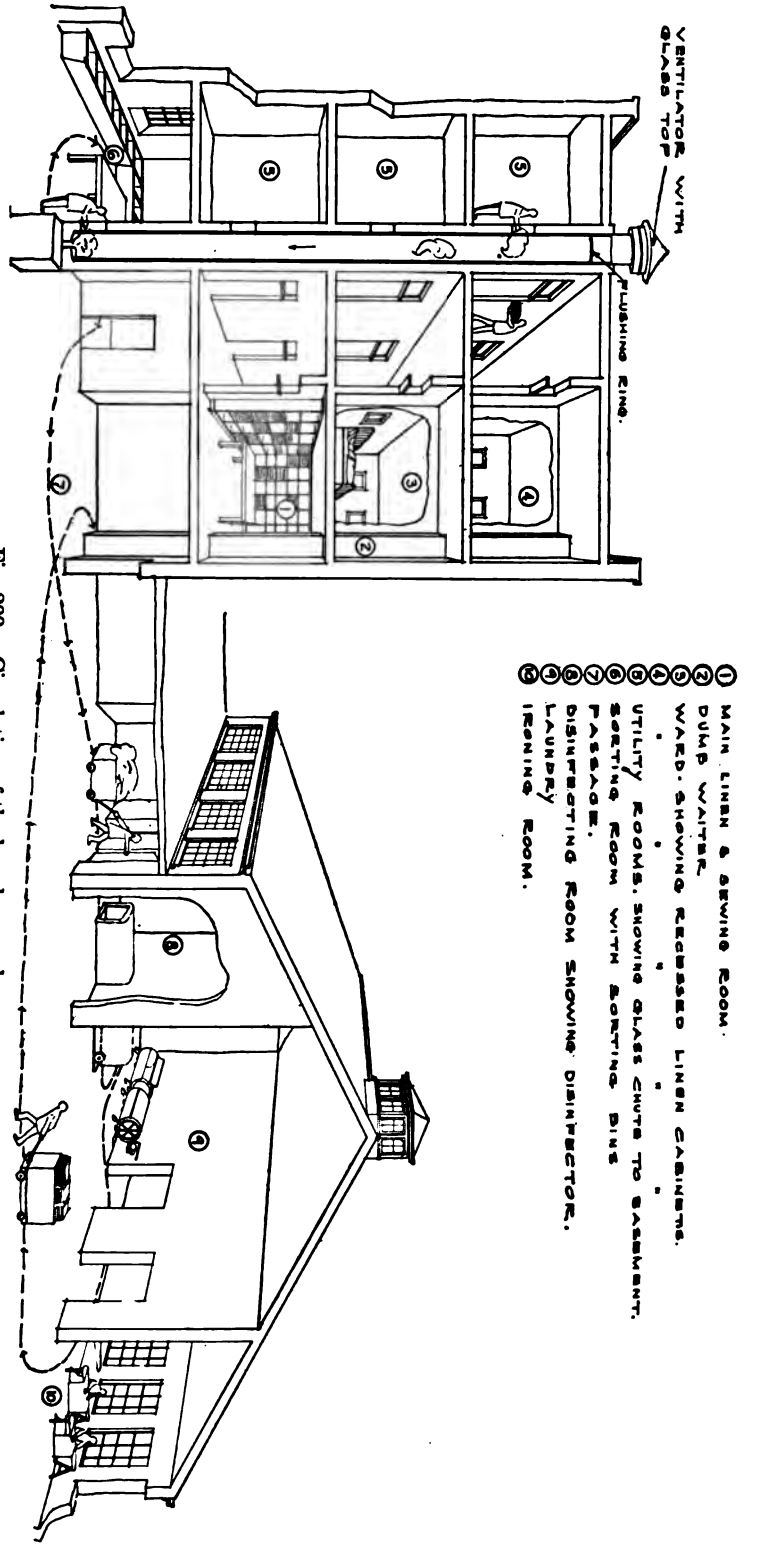

VENTILATOR WITH GLASS TOP
FLUSHING RING.
1 MAIN LINEN & SEWING ROOM.
2 DUMP WAITER.
3 WARD. SHOWING RECESSED LINEN CABINETS.
4 UTILITY ROOMS. SHOWING GLASS CHUTE TO BASEMENT.
5 SORTING ROOM WITH SORTING BINS.
6 PASSAGE.
7 DISINFECTING ROOM SHOWING DISINFECTOR.
8 LAUNDRY
9 IRONING ROOM.

Fig. 200.—Circulation of the laundry supply.

are then thrown back into the bags, the original copy is returned to the head nurse in the department from which the goods came, and the duplicate is forwarded to the laundry with the linen bags to be used in the laundry for purposes of checking, just as any other laundry list accompanies the bundle. When the laundry work for that department of the hospital is completed the goods are counted by the laundry again, checked from the list, and both list and goods are sent back to the linen rooms of the department, or to the main linen room of the hospital, if it is intended that all goods shall emanate from a central point rather than from the auxiliary linen rooms on the floors. The original list that had been returned to the head nurse of the department may be used by her as a requisition for an equal number of pieces of every sort in the shape of clean linens. If this system is kept rigidly there need be no loss of articles from the wash.

Upon the size of the institution and the amount of laundry work will depend the number of people who will be necessary to carry out this system efficiently. The system itself will not be worth while unless it is to be carried out with a precision amounting to a technic.

For a general hospital of, say, 300 beds, and that means for about 700 people under the average conditions, there should be about four linen collectors and distributors. These men will work in pairs. There must be two additional men in the counting-room, and to oversee this force there should be one head linen man, whose duty it should be to see that things are kept moving, and that the men under him shall transact their business in a prompt and workmanlike manner. He will also find time to trace lost articles.

The Equipment.—The character of hospitals differs so greatly that the equipment necessary for the laundry can be treated only in a general way. The remainder of this article will more directly concern the machinery required and its installation from the standpoint of the architect. By machinery is, of course, understood such as will do the requisite work with the fewest possible employees, thus eliminating needless expense for labor. The number of these will naturally depend upon the amount and quality of work to be done.

The laundry's cleanliness is a vital part of that of the hospital, and in consequence the utmost care should be devoted to its arrangement and equipment. It is wise in selecting the latter to know exactly the capacity of each machine and its method of operation.

Location.—The laundry should, whenever possible, be located in a separate building, for it may then have a very high ceiling, sloping toward skylights, roof ventilation, and windows on all sides, so that perfect ventilation and good daylight illumination will result without a spreading of the odors through the hospital building.

The laundry, if by necessity located in the hospital, should be at least 11 or 12 feet high, and have not less than two large vent shafts extending above the roof of the hospital, one to remove the air from the drying room, the other from the laundry proper; fans to positively move the air are a practical necessity, as are also suitable fresh-air inlets.

The Floor.—The floor should be built of concrete, with a water-proofed cement surface, particularly that part where the washing is done. There should be a general gutter built in as part of the floor. This gutter, which should have an outlet of at least 4 inches, should be built directly under the washers and tubs (Fig. 201).

Drains.—Iron pipes laid in the concrete floor when the latter is built should run into the gutter from all points where there may be water. A screen should be placed on the sewer outlet. This will prevent the pipe from clogging up with lint.

All the washing machines should drain into the gutter. If connected directly with the sewer, articles not easily removed might get into the pipes. This precaution does not apply elsewhere than in the laundry.

The amount of water used or the number of washers will regulate the gutter's depth and width. There should be a slope to the floor of ⅛ inch to the foot. In this way all the water will run off into the gutter and the floor can be easily flushed and cleaned. A sewer-trap connection should be made at the low point in the gutter. If it is thought that at some future time the washing equipment would necessarily be enlarged and more machines added, it is quite advisable to install an additional gutter in which these machines could be set at a later date. After the gutter is constructed in the floor, heavy brown paper can be laid in the same, and the depression of the gutter again filled with solid concrete, making the floor level. At any time it might be necessary to use this gutter, that part of the concrete above the paper can be easily broken out. This can be arranged for at the time the floor is being put in at about 10 per cent. of the cost of what it would be to do so at a later date.

Steam.—A suitable steam supply is the first requisite in conducting the laundry economically. The boiler should have a high pressure of at least 60 pounds, though not over 100 pounds will be required. This steam is not for heating water, but for

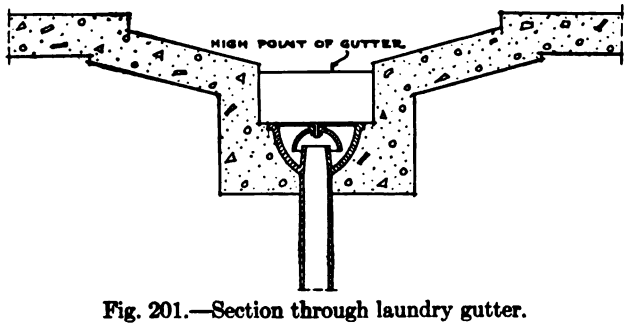


Fig. 201.—Section through laundry gutter.

heating working surfaces. When one boiler is expected to supply steam for the entire hospital it should be so connected to the laundry, either direct or through proper reducing-pressure valves, to obtain this required pressure.

Ironers and dry rooms are among the laundry machines requiring high pressure, and their capacities vary in proportion to the steam pressure. Locate the boiler room as near the laundry as possible, but never in the same room. An arrangement frequently acceptable is an independent power plant, with the laundry on the floor above the boiler room.

Water.—The laundry will require a generous supply of both hot and cold water. This should be furnished through galvanized iron pipes, at least 1 inch and preferably 1½ to 3 inches in diameter, depending upon the number and size of washing machines. Hot water for the laundry should be supplied either from a water-heating tank of ample size specially provided for the laundry or from the hot-water tank which supplies the institution.

Power.—Direct connected motors on each machine, excepting washers and extractors, should be used where possible, as the power is used only when the machine is in operation. Other advantages of this method are the ease of operation, absence of noise and dirt inseparable from the use of belts and the danger attending their use, and the ease and quickness with which the machines can be

put into service. The opinion that it is more economic to run a laundry by steam power than by individual motor drives may be borne out in the case of laundries operated alone or by their own separate power plants, but where a laundry is operated in connection with a hospital the steam supply and electric current for motors are usually available from the hospital plant at a lower cost than could be met by a steam engine-drive.

If each machine is not individually motor connected, and motor power is used for operating lineshafts from which they are belted, it is advisable that the equipment be divided into groups, arranged so that should trouble occur with one or more motors there would still be sufficient machines to permit of getting out the necessary work until the defective motors could be repaired or replaced; that is to say, one shaft and one motor would serve, say, one or two washers and one extractor, and another motor and shaft would serve to move another unit, so that a minimum of work could be turned out when the plant was running light.

While a single motor of sufficient size can be employed to operate the entire equipment, the power required to operate the power transmission machinery must then be used constantly even with a minimum load, as would happen with only part of the machines in use.

Laundry machinery manufacturers are constantly striving to perfect individual motor drives for each machine, but the present-day progress does not warrant the recommendation of attaching individual motors on each machine, for the reason that the constant reversing of the motor is required, and, owing to the extreme overload at the reversing moment, the life of the motor is greatly shortened, to say nothing of the troubles to be had with constant repairs of the reversing mechanism.

If belt drive is employed, only the best double leather belting should be used in the wash-room, as the belts are subject to unusual strain when the washing machines are in operation. They are being shifted constantly from one pulley to another and the wash-room is always damp. Under such conditions inferior belting would rapidly become worthless. Special pains should be taken when power comes from a belt drive to avoid noise or vibration. Protect the dangerous belts by shields.

MACHINERY

Sterilizer.—The hospital laundry may have a sterilising and disinfecting machine, unless this important service is performed at some other locality. As a matter of fact, it is highly dangerous to venture into the laundry precincts with infected goods, and they should be safely sterilized before being brought in. However, the laundry machinery people make and sell such a mechanism. These machines are built with a steam chamber, whose steel inner and outer shells form a steam jacket. The doors, which are at both ends, are fitted to close the cast-iron ends. The machine should be so placed that one end is in the soiled linen room and the other in the laundry. In this way all the goods must pass through the machine from the soiled linen room and be disinfected before they reach the laundry. The door that opens into the laundry is closed and the goods to be disinfected are placed in a wire basket. This is pushed into the machine, the door on the soiled linen side closed, and steam turned into the jacket. The sterilizer may be so equipped that both doors cannot be opened at the same time. The chamber becomes a drying oven, as the jacket is filled with steam during the whole process. By this process the goods in the machine are exposed to a high temperature before steam is introduced into the inner chamber and thoroughly dried after the steam

has been exhausted. A vacuum of 15 to 20 inches is produced before the introduction of steam to the inner chamber, a vacuum pump being supplied with the sterilizer for this purpose.

Sterilizing Washer.—This machine is built entirely of metal; from it vent pipes run to an exhaust fan or ventilating shaft; the door is fastened securely with thumb, screws after the goods have been placed in the machine and steam turned on. The goods are then washed in the usual way.

Washers.—Washing machines are of numerous types, some being built entirely of wood; some of wood, except the outer shell heads, which are of iron; and some constructed entirely of metal and of brass. Washers for hospital laundries should be built either of brass or with brass cylinders and galvanized iron shells, as these are the most sanitary, and will best stand the hard usage necessitated by the work.

As the goods are injured materially by live steam blowing directly into the linen and separating the fibers, every washer should be provided with some sort of steam syphon or steam distributing piping. To prevent the contents of the washer from becoming seriously tangled and torn, the reversing movement necessary in all washing machines must operate smoothly and uniformly in both directions. It is desirable that the washers be in small units to allow different classes of goods to be washed separately.

Extractor.—This extracts or removes the water by centrifugal force from the goods after the washing process. The goods are placed in a copper basket, built on a vertical steel shaft, at the bottom of which is the driving pulley. The basket is perforated and reinforced by steel hoops. The extractor travels at such a high speed that the best obtainable materials should be secured to guarantee safety. The best extractors are provided with heavy cast-iron outer casings or housings, this being one complete casting, no parts bolted together, which would require constant looking after to be sure that a serious accident would not occur. Balancing rubber springs serve to hold the curb or basket centrally, and rubber safety bumpers are provided to prevent the basket striking the shell if loaded unevenly. The extractor should be provided with an automatic safety cover, of a type that would prevent the machine being started until the cover is closed, and again prevent the cover being opened until the machine has been brought to a full stop.

Soap Tank.—A galvanized iron soap tank is needed to saponify to a liquid the chip soap generally used. This is needed, whether the hospital purchases its soap ready made or makes it from tallow and soap stock. This tank should be cylindric and have a circular brass steam coil at the bottom, capped on the end, and having small perforations about 3 inches apart throughout its extent to allow the steam to reach all parts of the tank. The tank should have a water supply and steam and water connections arranged for quick removal at such times as the tank needs cleaning. Laundry soaps are discussed at length under the section on Soaps.

Wash-tubs.—Every hospital should have stone or porcelain wash-tubs of not more than three sections each, furnished with hot and cold water, and one with a perforated brass steam pipe (similar to that in the soap tank) to boil water. This steam pipe should be connected with a swinging joint above the tub, so that it may readily be lifted up out of the tub.

Starch Cookers.—Starch is always needed, even in the smallest hospital, and some provision must be made for its preparation. A steam pipe, so arranged that it can be put into a pail or tub, is sometimes used, but it is not to be recommended. The chief objection to this method is the waste, as all unused starch made in this way has generally to be thrown away. The use of a starch cooker is the true economic method. This appliance is preferably made with a galvanized iron outer

casing and a copper lining; between these is heat-retaining material which keeps the starch hot for a long time. This cooker should have an automatic cover, a perforated steam coil, and a condensation trap or steam separator to separate the condensed entrained water from the steam, so that only the latter enters the starch. In such a cooker enough starch can generally be prepared and held for a week's use without danger of spoiling.

Starching Machines.—In most cases the starched work, such as the nurses' collars and cuffs, can be done by hand. Where machines are in use the dip wheel, as it is commonly known, is most frequently employed for starching collars and cuffs. When there is a large amount of such work it is advisable to install a collar and cuff starcher, a machine that starches the pieces completely at a single passage.

Dry-rooms.—Dry-rooms for hospital use are built either of metal or of wood, with a lining of asbestos and heavy tin. They are practically fireproof, easily cleaned, and easily kept clean. In the sizes usually called for in hospital laundries the dry-rooms are constructed in sections or compartments to contain clothes drying racks made up as trucks. The trucks, having casters, run on the floor, and can be moved to any part of the laundry. The heat is furnished by steam coils placed vertically, one at each side and others between the sections. These almost surround the trucks on which the goods are hung during the drying process. Dry-rooms, holding two or three trucks, suffice for moderate-sized hospitals, and additional sections and trucks can be added as the requirements increase. Usually one truck is furnished in excess of the dry-room capacity. This can be unloaded and reloaded while the others are in the dry-room. Another feature of the dry-rooms is a circulating fan at the top. This circulates the air in the dry-rooms, rendering the drying more rapid and uniform, and forces the moist air through a ventilating pipe which should be supplied. A dry-room, under ordinary conditions, with 80 pounds steam pressure should dry a load in thirty minutes. There are dry-rooms built which have the clothes draws suspended from overhead tracks or beams, but necessarily they are not so conveniently operated, as the clothes must be brought to the draws in front of the dry-rooms. In a number of large institutions the continuous "conveyer" type is in use. In this the articles placed on hangers are carried on an endless chain on a winding course within the heated cabinet at a speed so adjusted that they are thoroughly dried before emerging.

The dry-room steam coils should be provided with a good steam trap to permit the water of condensation to escape and hold back the dry steam. This condensed water should be returned by being piped back to the hot-water tank.

Dampeners.—Different goods require more or less dampening before passing to the ironers. Various machines have been designed for this, operated either by power or hand pressure. In some the dampening is accomplished by a fine spray, while in others the articles are passed through rubber rolls running in troughs where water is uniformly supplied. The former method is preferable.

Ironers.—The ironer is one of the most important machines in the equipment of the hospital laundry. To-day flat work is never dried in the dry-rooms, but is taken to the ironer direct from the extractor. High pressure is absolutely necessary to secure results. The cylinder type of machine is largely used for hospital work, the size of the cylinder being determined by the amount of work. These ironers are built with cylinders varying between 16 and 48 inches in diameter and from 48 to 120 inches in length. Auxiliary rolls, covered with wool covering, between which the goods which are being dried and ironed pass, are placed at various angles around these cylinders. This type of ironer, with its apron attachments, carries the goods around the cylinder to the side opposite from which they are fed, where

they are received and folded. The cylinder type requires less space for its installation. Another type of ironer is the chest type, where as many chests can be bought as the amount of work warrants. As the work increases other chests can be purchased and combined with those already in use. This type is especially useful in smaller laundries or where an increase in the work is probable.

The cylinder type of machine is much preferred, for the reason that the goods in being ironed are carried along by the travel of the cylinder under padded rolls that also travel with the cylinder; consequently, the goods are not subjected to the strain and wear that they would be subjected to while traveling through the chest type of machine, for in the latter case the chests are concave in shape and stationary, and the goods are carried over these chests by rolls and strings from roll to roll. It is easily demonstrated that a wet newspaper can be ironed without fear of tearing on the cylinder type of machine, while on the chest machine this would be an impossibility, which would readily show the merits of the cylinder type of machine. The custom laundries are favorable to the chest type of machine, owing to their somewhat larger capacity, and the fact that cheap hair covering can be used on them, but it must be remembered that the custom laundries are not handling their own goods, and they have no interest in how long the goods they are laundering will last.

No ironer should be purchased which does not have automatic safety devices at the feed side. These devices promptly bring the machine to a stop, and thus protect the operators from being caught while feeding the ironer, if accidentally they approach the rollers too closely. The automatic feed makes it possible to feed the goods straight and without turned edges. The ironer should be provided with a steam trap for the same purpose as the dry-room.

Body Ironer.—This machine was used originally for ironing the bodies of shirts. It is now also employed to iron underwear, aprons, coats, skirts, stockings; almost any garment in fact. It is built on the same principle of operation as the ironer, but has only two short rolls working free at one end. Between its rolls, one heated by gas or electricity, the articles to be ironed are placed. The rolls are then pressed tightly together by means of a foot lever and revolved. One operator with a body ironer can easily do the work of four hand-ironers. Some very small hospitals use it in place of a flat-work ironer.

Ironing Boards.—Every hospital and laundry should have two or more ironing boards for hand work. These are built on iron bases and are supplied with swinging sleeve boards.

Irons.—Cleanliness and economy advise the use of electric-heated flat irons, though there are grave objections to them as stated heretofore. If ordinary irons are used, gas sad-iron heaters should be furnished with the ironing boards.

Rotary Tumbler.—If the hospital is of such a size that 5000 pieces or over must be laundered each day a tumbler should be put in. This machine takes the goods from the extractor in a solid mass and shakes them up, removing all lint. Through its use much time is saved that otherwise would be spent in shaking out the goods before feeding them into the ironer. Another feature sometimes installed is the dry-room tumbler, a machine combining the principles of both. The goods, when taken from the extractor, are placed in a cylinder or compartment, where they are revolved in the same way as in a washing machine while exposed to a continual current of highly heated air. Unstarched goods thus dried do not require to be ironed. Starched goods, like nurses' dresses, can be kept in this machine until about nine-tenths dry and then passed to the ironer, eliminating the necessity of dampening. A greater saving is to be had with the use of this machine than with

the regulation dry-room, for in the former help is required to hand the goods up and to take them down, while the washman or wringer-man can do this work with a dry-room tumbler. There is no form of drying blankets, bath towels, etc., where the work will be as soft and as beautifully finished as when dried in a dry-room tumbler. With it the feather pillow can be washed the same as a sheet, extracted in the same manner, and then placed in the dry-room tumbler and thoroughly dried, which gives renewed life to the pillow, making it sanitary and sweet smelling.

Collar and Cuff Ironer.—If the hospital has more collars and cuffs than a hand ironer can dispose of in an hour a small collar and cuff ironer should be installed. This machine has a heated and padded roll, through which the pieces receive much more pressure than when ironed by hand or in a body ironer.

A curtain stretcher is another laundry requisite. A good type is a frame made of galvanized iron pipe with adjustable corner sockets. Others are made in the form of curtain trucks which can be run into dry-rooms.

Insulation.—Cover all steam pipes with high-grade insulation. In every well-equipped public laundry are numerous serviceable and efficient machines, which might be installed to suit various special requirements with profit and advantage in a hospital plant. Those mentioned, however, practically cover the requirements in a manner to give satisfactory operation.

LAUNDRY POWER

It appears practically impossible to give figures for the required horsepower and current which would be universally applicable and without danger of having them misapplied.

The following will serve as a guide, but must be verified by an expert previous to making use of them in individual cases:

Power in Laundry:

One 28-inch extractor requires	2 H. P.
One 36- by 62-inch washer requires	3 "
Two 36- by 62-inch washers require	5 "
Three 36- by 62-inch washers require	7½ "
One 36- by 48-inch washer requires	2 "

Speed of extractor, 900 to 1400 RPM, depending on the size of the basket.

Flat work ironer	1–2½ H. P.
Collar and cuff ironer	½–1 H. P.
Body ironers	½ H. P.
Shirt ironers	½ "
Handkerchief ironer	½ "
Band ironer	½ "
Starchers for collars, shirts, etc	½ "

Electric Heated Laundry Machinery:

5½-pound irons consume	600 watts per hour.
Shirt ironers consume	1100–2200 watts per hour.
Body ironers consume	2200–3520 " "
Band ironers consume	550– 650 " "
Collar ironers consume	650–2500 " "
Sleeve ironers consume	1100–1600 " "

Linen Collectors.—A very convenient form of linen collector is shown in Fig. 202. The stand is made of wrought iron, and consists merely of two rings, to which three upright pieces are riveted. It will be noticed that these uprights are not equidistant from each other, and that one-half of the stand is free for the purpose of

drawing out the bagful of linen. The stand is very firmly fixed on turned feet, or, if preferred, casters can be used. As a rule, this stand will not be moved about much and casters will hardly be justified. The bag is made of rather heavy canvas, but not too heavy to be washed easily. It has a bucket-shaped bottom and draw-string in the top. There are brass eyes at intervals in the bag and hooks on the inside upper rim of the stand. It is very easy to release the bag from the hooks and to draw it out through the large opening in the stand. The linen is carried to the laundry and to the counting-room in these bags, and the bags are washed and returned to be used as a receptacle again. If a linen chute is used in the building,

Fig. 202.—Linen collector.

these linen bags prevent very much tearing of the linen, and make it unnecessary for the help to tie up the soiled linen in the sheets or bedspreads, which they are very much inclined to do.

EQUIPMENT OF LINEN ROOMS

Before we can equip the linen rooms and their appurtenances it will be profitable to trace the linens of the institution from their source on the shelves back again to the same resting place, and to follow them through the process of becoming soiled and again becoming clean, and the various steps of their travel, as shown in the laundry travel illustration heretofore.

In the first place, the linens are taken from the linen room by or at the instance of the senior nurses at the heads of the departments, on requisitions signed by the superintendent of the training-school or head nurse. The physical operation of

taking them is generally performed by the orderly, who takes the requisitions to the linen room keeper and receives the linens in return. The linens are then taken to the auxiliary linen rooms off the wards, or somewhere on the corridors of the private pavilion. These auxiliary linen rooms and the key are kept by the head nurse, who distributes the linens at certain times to the nurses in the various departments of her territory. The soiled linens from the beds are then thrown into the soiled linen receptacles and the clean linens put on the beds. These soiled linens are then gathered up by linen collectors, employed for the purpose, or by the orderlies on the floors. Sometimes these receptacles are taken directly to the laundry, either by way of laundry chutes or freight elevators, and without any counting or other method of segregation. The linens are then washed, and are taken on the linen trucks back to the linen room and restored to the shelves. These processes of movement require certain equipment, and the simplicity or complexity of that movement will depend a good deal on the disposition of the hospital administration to keep accurate accounts of its operations, the size of the institution, and sim-

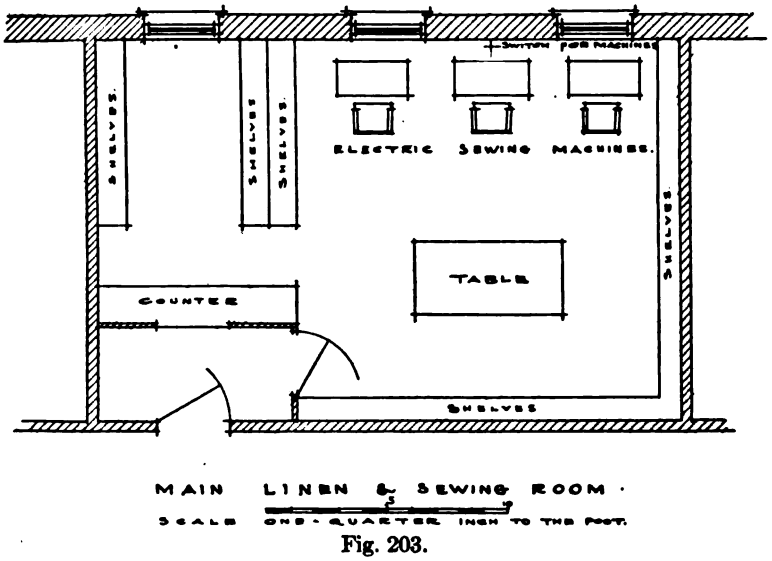


Fig. 203.

plicity or complexity of the units of the hospital. That is to say, a railroad men's hospital would require comparatively few units of linen, whereas a general hospital, containing a maternity, a children's, surgical, medical, and special departments, would require a vast number of different sorts of linen, and consequently the process of handling the linen would become a very intricate one.

However, let us now proceed to the equipment of a linen service as though we intended to keep a strict account of our linens and to do the thing in a methodic, workmanlike sort of way. The linen room is a simple affair, as shown in Fig. 203, composed of a single large room with a high ceiling, with shelves on all sides, excepting where the doors and windows are. These shelves must go up so high in the room that a substantial stepladder will have to be used half the time to get at the compartments desired. Unless the shelves go clear to the top of the room the top should be beveled with a steep pitch, so that dirt can be seen on the top. Drawers should never be used, and the only particular point about the shelving is the doors, and these doors should be hinged at the bottom and fastened at the top,

held with a chain on each side, so that when they are opened they form a flat shelf for the handling of the pieces as they are drawn out of the shelving. The catch to this door is the most important thing about it, and most catches are cheap, poorly made, and soon get out of order. There is no particular kind that is best.

The linen rooms ought to have two doors, one leading directly into the body of the room and the other fronting up against a counter, as shown in the cut, since it is not desired that the nurses and orderlies who are requisitioning linen shall come into the room itself.

Since the hours for requisitioning linen are short, all of the materials for work in the linen room ought to be in the room itself, so that all of the people who are working there can make the most of their time. When there is no distributing they can be mending or sorting.

Generally speaking, the linen room of a large institution will be presided over by a head woman, and she will usually have at least one paid assistant. In most institutions the probationers from the nursing department do the greater part of the mending and the making of new things, so that it will be necessary for the linen room to be equipped for running the sewing machines, and this can be done very nicely, as shown in the cut. The day is past when women, whether they be paid linen menders or workers, or whether they be probationers in a training-school, can be expected to work a foot-pedal sewing machine all day. That operation is one of the hardest tasks that a woman ever has to do, and is almost certain sooner or later to disturb the functions of her genito-urinary and gastro-intestinal viscera.

A line of shafting, belted to the running gear of the individual machine, is entirely too intricate a mechanism to be operated easily by women. There is too much mechanics about it; therefore, the correct way is to operate each machine by its own individual motor with belt-drive to the machine mechanism. In this way the pulleys and belting can be made of proper size and length to accommodate any desired speed in the machines, and it is far preferable that these motors have at least three speeds, attained preferably by knee action.

This is practically all there is to the main linen room, which must, of course, be well lighted and well ventilated.

AUXILIARY LINEN ROOMS

The auxiliary linen rooms of the institution are of little importance so far as their internal arrangements are concerned, but of immense importance as to their location. Ten yards too far one way or the other for the auxiliary linen rooms will mean hundreds of yards of walking per day for the nurses, and this means time and labor that in the course of the year are well worth saving, so that great care must be taken to locate these auxiliary linen rooms at the most central points nearest to those centers where the vast bulk of the linen is to be used.

Generally speaking, these rooms cannot be lighted from a window, and, therefore, they should have one or more electric drop lights operated by means of a door switch, so that the lamps will be lighted when the door opens and put out when the door is closed. The room itself should be long and narrow, with shelving on one or both sides, the shelving built precisely as the shelving in the main linen room, with drop doors that can be used as tables on which to work with the linen. Nothing should be kept in these auxiliary linen rooms excepting the linens, and by no means should the blankets be kept there, because necessarily these rooms will be without ventilation, or practically so, and blankets should never be kept except in a well-lighted, well-ventilated, dry place.

SOILED LINEN COUNTING-ROOM

If any sort of reckoning is to be kept on the linens in the institution there must be a central counting-room, through which all soiled linens must go on their way to the laundry, and if this work is to be done in a methodic, comprehensive, efficient manner, this central counting-room for soiled linens is an item of importance in the institution. It may be at the foot of the freight elevator, if the soiled linens are carried that way, or it may be at the bottom of a chute, if the chute method is employed to get the linen bags to the main floor. In either case, the counting-room is merely a large room containing a considerable number of bins, on at least three sides of the room, and with a large central platform, about 18 inches high, occupying most of the balance of the floor space in the room, leaving only sufficient floor space for a roomy walk. The bags of soiled linen may be dumped from the freight elevator or chute into the room. This whole equipment presupposes that the laundry is in a building entirely separate and at a distance from the hospital.

LAUNDRY CHUTES

One of the petty annoyances of the daily hospital life is the carting about of soiled linens. Crude methods are in vogue in most institutions. Baskets and carts, and the elevator, passenger or freight, are the commonest means of transportation. There are chutes extending from the top of the house to the bottom in many hospitals; some of them made of tongue-and-groove flooring and others of galvanized or sheet metal; usually they are built inside the house, and almost always they are dirty, drafty, ill-smelling places, streaked with dried blood or worse, and are a constant fire menace on account of the drafts they harbor.

In some hospitals the chutes are rendered as mildly offensive as possible by the use of heavy canvas laundry bags, but it is extremely difficult to enforce the use of these bags on the wards of a hospital or on the floors of a hotel. Nurses in a hospital almost refuse to use them, and persist in tying the laundry in sheets and throwing it into the chute; the sheet used for the purpose is torn in almost every case, if not in the chute itself, certainly in the further journey to the laundry at the hands of the linen men. Sometimes the nurses use pillow cases instead of laundry bags, as being more convenient and more often within reach, and the pillow case is always useless thereafter.

If the ordinary chute is to be used, it should be placed outside the building, along a tier of windows, easily accessible, with an opening at each window, and with small ventilated intervals throughout the chute, the ventilators made so that rain and snow cannot penetrate; there can be an upturn at the bottom to break the fall and slide the bundles to a table or platform. These outside chutes do not remain any cleaner than those inside, but they are not offensive and do not encourage drafts. They can be cleaned occasionally by hand, the workmen being lowered on a pulley seat, steeple-jack fashion.

Europe, and more especially Germany, is adopting a glass cylinder chute that is a distinct advance over other methods of transporting soiled clothes. The chute, when completed, is 3 feet in diameter, and extends from the basement collection room to a point at the elevation of the roof, with roof ventilation and with openings at each floor. There are showers in the top, with small holes bored at intervals, and in such manner that the water will shoot outward to the walls of the chute; both hot and cold water are used for cleaning.

The walls of the chute are made of heavy, cheap glass like that used for area sidewalks, and in semicircular segments, 3 feet long and a half-circle in shape,

two of them make a section of chute 3 feet long, and they are bound together by a special glass cement.

Another form of linen chute is patterned after the circular fire chutes used in connection with some schools and asylums, with smooth spiral surface for sliding the baskets or bags. Still another form, suggested, if not actually in use anywhere, is patterned after the parcel conveyors in some of the large department and mail-order houses. It is an endless-chain arrangement with shelves at intervals. There is a mechanism by which the chain is automatically stopped whenever one of the floor doors is opened, and when the door is closed the chain is released to move along. The difficulty with this system is that it is very noisy, a matter of not very much moment in a mercantile house, but vital in a hospital.

A newly devised laundry chute, and one which promises to bring the chute principle into greater favor, is made by the Pfaudler Co., of Rochester, New York. It was originally made and is still used for beer vats, but has been shaped differently and perfected for service as a laundry chute. It is installed for the first time in the new Sarah Morris Hospital for Children of the Michael Reese Hospital.

It consists of rings of iron, glass lined on the inside, and is made in sections or rings, 3 or 4 feet long, and of any desired diameter. The sections are made gasketed, so that they fit water-tight one against another, and the chute can be made of any desired length in that way. The joints are so perfect and the sections fit so closely that they are waterproof, and can thus be washed out at any time with hot or cold water shower at the top.

The glass is fused into the metal at a temperature of about 2600° F. and does not crack or split off under any variations in temperature. The bottom of the chute ends in a drain-pipe with trap and grate, so that it is perfectly clean and sweet all the time. At the top there is a shower crown for hot and cold water for cleaning purposes. The top of the chute is led to the roof, and is covered with a hood. Figure 204 shows some of the details of this chute.

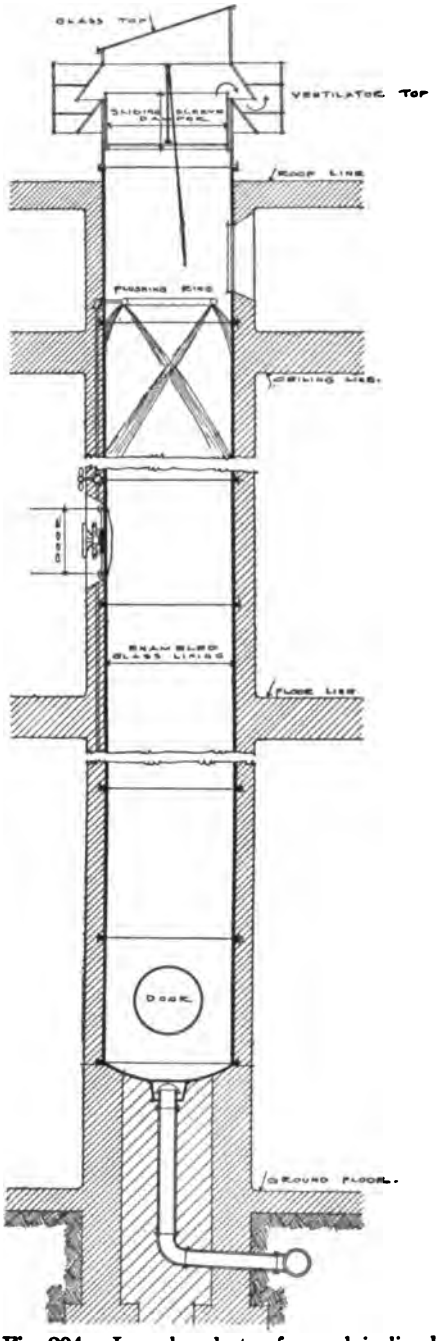


Fig. 204.—Laundry chute of porcelain lined cast metal.

THE DESTRUCTION OF WASTE

MODERN practice will not permit of any other method of the disposal of garbage and waste of all kinds than its absolute destruction by fire. But there are several things to be taken into consideration in connection with the burning of waste: First, all garbage and waste must be destroyed under conditions that will not permit infections of any kind to be scattered about the premises or go into the sewage system of the institution or of the community; second, it must be destroyed in such a way that valuable things, such as silverware, dishes, and cleanable rubber articles, shall not be thrown away; third, it must be destroyed under conditions that will create the least possible nuisance in the form of odors and smoke.

Let us speak very briefly, now, about another disposition of certain parts of the waste. Small hospitals, in the country or in small cities, usually are importuned by farmers, either raisers of pigs or poultry, to give their garbage for food purposes. There can hardly be an objection to this, but the institution must be responsible to the community in which it exists for correct practice in all things; therefore, it should insist that waste food should be taken away and used under conditions that are proper, considering the stock to which it is to be fed. A good many swill and slop collectors are in the habit of getting around to the tanks two or three times a week; in the summer time this is out of the question, both from the view-point of the institution, on account of the odors that emanate from decomposing waste and from the standpoint of the stock to which the waste is to go, because decomposing stuff is not proper food for animals. Then again it is highly necessary, if we are to allow garbage collectors to take our food waste, that there should be some means to guarantee the cleanliness of this waste; that is to say, no possible infectious matter, such as soiled bandages or dressings or the fluids from these, should be allowed to get into and contaminate the slop barrels.

Some institutions have farms of their own or are in close relationship with nearby farmers, and their slops are saved with almost as definite a technic as any other routine process of the institution. There are tight metal receptacles for each kind of waste, one for cabbage and lettuce leaves, celery tops, potato peelings, and so on; another for the residue of the soup stocks, that is, the used meats that are of no further use. Then there are other receptacles for feathers or the intestines of poultry. And then there are still other receptacles for the combination wastes that come from the serving rooms and dining rooms—the scrapings of the dishes.

Some institutions save their feathers, wash and dry them, and make them up into pillows, and this is not a difficult thing to do, provided there is a rotary air blast laundry tumbler at hand. But it may be very seriously questioned whether institution employees will earn very much at this kind of work. They are not experts at it, they do it very slowly, and at the end of the year it will probably be found that their time could have been more profitably employed at things in which they were more skilful.

Both hogs and poultry are very fond of the intestines of poultry and devour them with great relish, and when fresh and unfermented there seems to be no reason why this offal should not be good food. The contents of the intestines are usually

made up of partially digested grain, and the intestines themselves contain about as much nutriment as a similar weight of any other meat; but it may be very seriously questioned whether either poultry or hogs will be benefited very much by feeding on intestines and their contents that have laid in the slop barrel for several days, especially in warm weather.

The above specialized treatment and husbandry of waste food products, and their profitable employment as food for animals, will perhaps appeal more to small institutions, located in the neighborhood of a farming community, than to the large metropolitan hospital, situated far away from the country; and most of us will perhaps want to destroy nearly all the waste that comes out of the institution. Then we ask ourselves what is the best method for its destruction; naturally, burning, but in what way, and can it be done more economically and effectively in one way than in another?

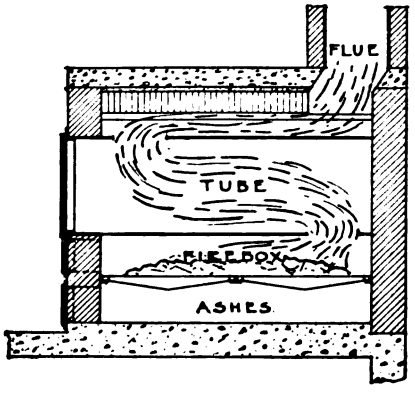
There are patent garbage incinerators of all sorts, and these may be classified under three heads—first, the central garbage burner, located in an outhouse, to which everything goes; second, a combination boiler and garbage destroyer, for small institutions in which the garbage is made to play its part as a fuel; third, the so-called sanitary garbage incinerators, located at different points inside the institution and connected to a flue.

The Sanitary Garbage Plant.—There is very much doubt whether anything is more economic or efficient and sanitary than a garbage incinerator, properly built and located in some outhouse. Figure 205 shows as simple and efficient a garbage burner as can be built. There are much costlier ones that can be purchased outright, and set up inside a brick wall in about the same way that the ordinary home basement furnace is set up and bricked in. These purchased incinerators cost from $1200 to $2000 each, and they are not more efficient or economic than the home-made affair that costs in the neighborhood of $300. The illustration shows a large central door at the top, into which all the garbage, including the fluids, is thrown. Inside this door is a wrought-steel tube, open at both ends, and having a diameter of about 30 inches. Both ends are open, one backing up tightly, and sealed with fire clay against the door; the other end is left open, giving a free exit to the flue. This tube is about 5 or 6 feet long, or longer if the amount of garbage is sufficient to justify so large a receptacle. On either side, and below this large door, are two smaller square ones, and these are where the fires are made. They are ordinary grates, almost as long as the tube above, and there is free access from each to the flue at the rear. Below these two doors are two smaller ones for the withdrawal of ashes.

The process of operation is as follows: In the morning a small coal fire is made in each grate, and for a very large institution not more than 200 or 300 pounds of coal need be used in the course of a day. This first fire heats the tube and dries all the moisture out of the garbage that has been thrown into it; then, with a shovel made for the purpose, the dried out garbage is withdrawn from the tube and thrown into the fires. Then more garbage can be thrown in, and so the process goes on throughout the day. It is necessary to comb the garbage carefully to save the valuable things that have been thrown into it; in some large institutions, such as the Massachusetts General Hospital, the garbage comber is a fixture in the community—an old man, worn out in service elsewhere in the institution, but conscientious and careful, and to be trusted to return the salvage to some central point designated for its reception.

In the Michael Reese Hospital an attempt is made to locate the sources of improvidence by numbering all the garbage cans, each having its own location in

the house. Articles of value of all sorts, including broken dishes, are wrapped up after they have been retrieved and are sent to the storerooms, with the number of the can from which they came; given a knowledge of the people who are using a particular can, it is not a very difficult matter to locate a nurse or maid or orderly who has been reckless and careless. Where this sort of incinerator is employed there is a concrete floor in the house, just in front of the furnace, sloping toward the center,



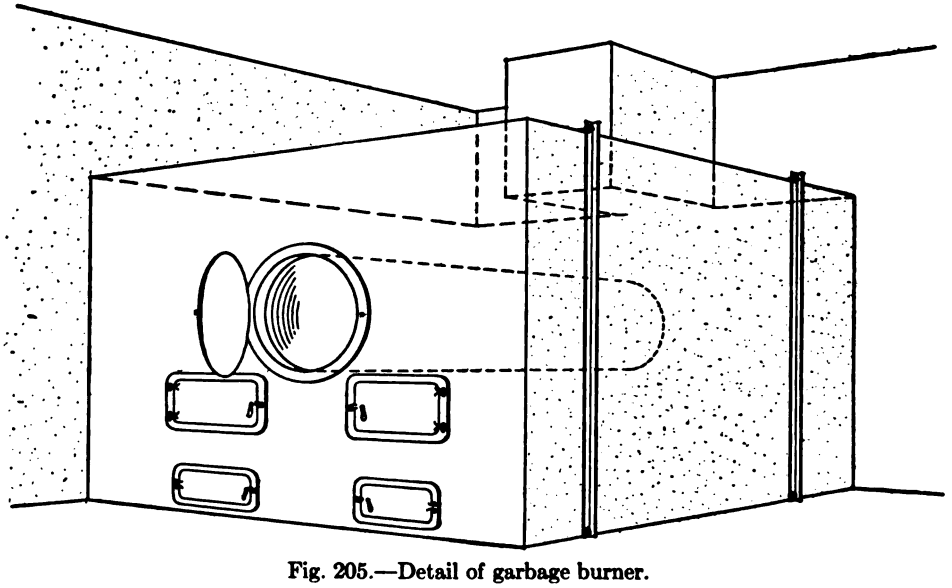


Fig. 205.—Detail of garbage burner.

but without drainage, the purpose being to collect all the garbage, including the fluids, and with a specially devised shovel the whole mass is thrown into the tube. The water of the garbage of course goes out as vapor, and there is no chance for any infected matter to get into the sewers, because in the evening the floor is thoroughly carbolized and left to stand over night, when the fluids are swept over the high point of the floor and into a sewer runway the next morning.

Combination Garbage Destroyer.—There are several makes of furnace advertised to permit of the use of the garbage as a part of the fuel for heating the building. This system is devised for small hospitals. Not enough is known definitely, at least by the author, to say whether there is any economy in burning garbage as fuel on so small a scale. Many good engineers testify that the wetting of the fires, and the consequent increased amount of fuel necessary to keep the boilers going, will more than overcome any saving to be gained by the use of the dried garbage as fuel. If this system could be practised on a very large scale engineers say the saving would be considerable, because a specially devised drier could be utilized for

Fig. 206.—The Preston house incinerator.

drying the garbage before attempting to use it as fuel. But engineers say that such a system would resolve itself into a commercial proposition, and its value be dependent on the technical handling of the plant, and that it would probably save nothing in the average institution, and would cause much inconvenience, annoyance, and possibly lead to infections.

The Ward Incinerator.—Figure 206 shows perhaps the best example of garbage burner to be utilized at various points about the institution. The manufacturers, J. B. Preston & Sons, Webster, Mass., claim for this article that its employment is without odor and without any dirt whatever. They advertise the process as fol-

lows: The garbage and waste of all sorts are thrown in at the top of the burner, and at intervals of a few hours the gas is lighted beneath and the whole contents destroyed. There are a good many of us who might have in mind institutions in which such a process could not be carried on without dirt and drippings, and there is no question that the avenues for loss are thrown wide open. No one is present to comb over the contents of the incinerator and retrieve valuable linens, rubber goods, and other articles of constant use about the service rooms, so that it is greatly to be doubted whether this form of incinerator will not conduce to recklessness and carelessness on the part of employees and nurses. It may be frankly stated that the author has no first-hand knowledge of the use of this incinerator, nor has he been able to find anyone who can speak at first hand on the subject, and whose testimony would carry weight for the purposes of institution management. There are a great number of these incinerators in private homes, where they seem to be efficient and convenient.

THE INSTITUTION BAKERY

THE question whether an institution shall bake its own bread or buy from a commercial bakery is one that will have to be answered according to individual conditions. In the very small hospital undoubtedly the general cook can bake what bread is required and cook whatever pastry will be needed, and the cost will be covered by the raw material, and this may be said of any institution that is not large enough to require a professional baker and a regular baking plant. As soon as a regular baking organization must be installed the expense will undoubtedly be greater than it would be to purchase the bread outright from a commercial baker. At a certain size, however, it may well come to pass that a home bakery will save money, and be an economy from other standpoints; that is, in the side lines that can be prepared, such as cakes, pies, and so on.

It is very doubtful if the average institution, especially in the large cities, where competition among bakers is rather keen, will save any money by baking its own breads and cakes. In the Michael Reese Hospital, where the goods are bought from a reliable baker, the regular purchases are about as follows for the day:

80 to 100 hotel loaves.
15 Viennas.
16 home made.
7 rye.
26 dozen rolls.

This list is added to frequently by assorted cakes of all sorts and occasional fancy pieces. The bill of the hospital averages $9.89 per day, and we are confidentially informed by our baker, and we believe this to be true, that there is a net profit to the baker of 49 cents per day, and the baker divides his cost as follows:

Material consumed	$6.40
Labor	1.75
Delivery	1.25
	$9.40

If it is intended to install a bakery for this size of establishment, the equipment would be about as follows, with cost of each piece:

1 small three-deck portable oven (gas)	$140.00
1 4-foot steel bread trough	18.40
1 trough dividing board	1.50
1 trough cover (wooden)	3.75
2 bread peels ($1.40 each)	2.80
2 bread boxes ($2 each)	4.00
2 cloth covers (60 cents each)	1.20
36 stock pans (35 cents each)	12.60
125 hotel bread pans	31.25
1 hand flour sifter	7.50
1 dough scale	2.50
1 30-inch galvanized bowl	6.00
1 bowl knife	.50
1 wash-bowl	.35
2 galvanized pails (20 cents each)	.40
1 quart dipper	.25
1 Vienna knife	.25
1 rolling pin	.35
2 scrapers (30 cents each)	.30
1 bread rack	25.00
1 thermometer	1.25
1 small galvanized proof box	18.00
1 small single pan rack	10.00
Total cost of equipment	$288.45

A shop of this size would require a space 35 by 20 feet. The expense of operating would be as follows per week as an overhead charge:

Labor, one man at	$20.00
Gas for oven	4.00
Breakage and waste	.90
Depreciation at 10 per cent. annually	.55
Interest on equipment at 6 per cent	.26
Total weekly operating expense	$25.71

The above expenses of operating would be practically the same for any institution large enough to require a special baking department. Now let us include the $6.40 per day, or $44.80 per week, the actual cost of the material consumed, which, with the cost of operating, amounts to $70.51, or a small fraction over $10 per day, against $9.89, which the hospital actually pays for its bread.

This does not mean a loss to the baker, however, since the operating expenses in a large bakeshop are the overhead charges for baking a very much larger amount of bread. For instance, the baker will bake for several institutions as large as the hospital for the same money, and perhaps the profit to the baker could be made to show a profit of almost as much as the total operating expense of the hospital bakery.

These figures seem to the author most illuminating, and demonstrate clearly that a hospital bakery does not pay, even assuming that every batch of bread started is to turn out right, which is never the case. Often there are wastes, whole batches are burned, or fail to rise, or are in some way spoiled. Moreover, with ordinary hospital machinery it is impossible to guarantee uniform mixing or uniform baking arrangements. If we obtain our bread from a baker we have a right to turn it back to him if it is not satisfactory.

The final conclusion is that in an institution sufficiently small for the regular cook to do the baking with her own help, home baking is an economy, and the bread supply will cost just what the raw material is worth, plus, perhaps, a little extra gas or fuel, but that there will never be a saving to the institution that runs its own bakery when it is large enough to require a regular baking equipment.

INDEX

Acid, carbolic, cost of, 401
Administrative units, 40
Admission rooms, 40, 135, 340, 344
Adrenalin, 373
Adult dead body, 378
Aërating beds, 94
Air cleansers, 102
  coolers, 103
  drafts, 103
  intakes, 102
  operating-room, 103
  pressure piping, 86
  supply, 83
  valves, 84
Albumin, 382
Alcohol catgut preparation, 364
Aluminum ware, 569
Alumnæ Associations, 307
American Civil War, 304
  microscopes, 383
  plans, 37
  Sterilizer Company, 164
Ammonia compression system, 104
Amphitheatre, postmortem, 388
Andrews Heating Company, 95
Anesthesia, danger signals, 375
  death of, 374
Anesthetic, 287, 288, 339, 369, 370
  choice of, 371, 374
  cost of, 372
  preparation of apparatus, 373
  purpose of, 369
  staff, 369
  table, equipment, 358
Anesthetist, 339–368, 373
Anesthetizing room, 50
Animal cages, 389
  room, 388
Annunciator, 91
  dumb-waiter, 93
  electric lamp, 92
  elevator, 93
  interns', 93
  nurses', 93
  supervisory, 92
Antimeningitic serum, 380
Antisepsis, 305
Antitoxins, keeping of, 404
Apartments for patients, 111, 117
Apomorphin, cost of, 401
Apparatus, 86
  anesthetizing, 217
  cautery, 218
  gas oxygen, 370
  heating, 80, 83
  preparation for anesthetic, 373
  rebreathing, 371
  surgical, 184
Appropriations, 21
Arc lights, 88
Architectural expenditures, 27
  mistakes, 33
Architecture, hospital, 33–156
  of small hospital, 140
  pavilion style of, 35
Area plans per patient, 40
Arm immersion stand, 213
  rests, 184
Arm-bake, 396
Arnold sterilizer, 383
Arrangement, medical unit, 45
Arteriosclerosis, 394
Artificial respiration, 375
  ventilation, 27
  water cures, 393
Asepsis, 82, 360
Ash handling, 81
Ashby Sewage Disposal Company, 95
Association support, 24
Attending physician, 381
    rules for, 346
Autoclave, 83, 163, 170
  laboratory, 383
Automatic stokers, 81
Auxiliary laboratories, 286, 381, 382
  medicine cabinets, 402

Baby, care of, 350
Back-rests, 177, 183
Bacteria, pathogenic, 383
Bacteriology, 379–391
Bakery, 83, 116, 631
Bakes for neuritis, 395
Balance sheet, 524

Bandages, 352, 353
Basements, 51
Bases, coved, 64
Basins, temperature of, 354
Bath, portable, 199
  waters, temperature, 397
Baths, 393, 394, 397
  for insane, 397
Bath-tubs, 95–98, 99
Battey, cystoscopic, 222
Battleship linoleum, 384
Bausch and Lomb microscope, 382
Bed, brass, 176
  cage in, 182
  castors, 185
  cross-bar of, 186
  hospital, 176
  linen, 599
  posts, 182
  rails, 179, 181
  raisers, 184
  raising, difficulty of, 184
  rollers, 185
  screens, 197
  slats, 178
Bed-pans, selection, 545
Bed-rests, 183
Bedside annunciators, 91
  tables, size of, 187
Bedsprings, 178
Bell signaling, 92
Bernstein bed raiser, 185
Beta-eucain, 354
Bethesda water cure, 392
Bichlorid solution, 167, 353
Billroth, 305
Bills, patients', 380
Biologic preparations, keeping of, 404
Black waxed silk, 354
Blakeslee dishwasher, 230
Blanket warmers, 49, 80, 83, 159, 160
Blankets, purchase of, 542
Blood count, 382–391
  pressure, 382–391
  stream, 394
Board of directors, 248–252
Bodies for morgue, 378
Boilers, 80, 81, 83
  food, 83
  soup-stock, 231
Boin Steel Range Company, 235
Bone drill, 219
Books in sick room, 202
Boric acid solutions, 353
Bottles, drug store, 402
  laboratory, 402
Bottles, medicine, 400
Box springs, 178
Bramhall sterilizer, 169, 170, 183, 393
Brass beds, 187
Bread slicers, 232
Breeding cages, 389
Brick, 53
Brooms, purchase of, 578
Brushes, purchase of, 579
Buck's extension, 184
Building, cost, 27
Bunkers, coal, 81
Butcher shop, 238
Butter, purchase of, 556

Cabaret commode, White Line, 195
Cabinet baths, 394
  dressing-room, 224
  instrument, 215
  sterilizer, 172
  sweat, 396
Caffein, 373
Cages for animals, 389
Calisthenics, 393
Calling nurses, 91
Cameron-Wiley Company, 95
Camphor compounds, 373
Canned goods, imported, 566
Capillary congestion, 394
Carbolic acid, 5 per cent., 354
    cost of, 401
Carbon-dioxid gas, 383
Carbonic acid system, 104, 105
Care of baby, 350
  of children, 341
  of mother, 349
Carlsbad baths, 393
Carts, dressing, 225
  irrigator, 212
Casement windows, 75
Castor oil, cost of, 401
Catarrhal affections, 20
Catgut, sterilization, 361–365
Catheters, care of, 355
Celloidin microtome, 384
Cement roofs, 59
Central laboratories, 381
Centrifuge, electric, 382
Ceramic tiles, 65
Cesspools, 95
Chair, commode, 194
  for insane persons, 195
  laryngologist's, 223
  ophthalmologist's, 223
  wheel, faults of, 193
Chairs, 190

Character of hospital, 20
Charity hospitals, 17–20
  patients, food for, 591
Charlatinism, 393
Checks, door, 79
Chemical solutions, 161, 169
  water cures, 393
Chemicals for catgut preparation, 362
Chicago Surgical and Electrical Company, 217
Chicory, 568
Child, bed for, size of, 180
  dead body of, 378
  linens, dishes, dressings, 180
  thermometer, 180
Children, care of, 341
Children's beds, 179
  bedside tables, 188
  department, general rules, 340
  diseases, 20
  hospital, 3, 121, 139
  tables, 188
Chinaware, 572
Circulatory diseases, 393
Circumcisions, 345
Classes of hospitals, 17
Claudius' method of catgut preparation, 363
Clay tiles, 55
Cleaning the hospital, 596
Clinical laboratories, 381
Closet bowl, 100
Closets, dressing, 135
Clothing, receptacles for, 202
Coal elevators, 81
  supply, 81–85
Coats and gowns, purchase of, 543
Cocain HCl, 353
Coffee, purchase of, 566
  urns, 83, 236
Cold-water pipes, 86
Collodion, 378
Columbia University, 320
Commercial company lighting, 82
Commode chair, 194, 195
Communicable diseases, 20
Community needs, 17
Composition roofing, 59
Concealed piping, 86
Concrete foundations, 51
  ribs, 56
  slabs, 55
Condensing engines, 85
Consent for operation, 345
Construction, hospital, 86, 139
Containers, hot-water, 208
Control table, 397
Conveyors, coal, 81
Cooker, vegetable, 234
Cooking, 82
  utensils, 83, 568
Copper jacket incubators, 383
Copperware, 569
Cork floors, 66
Corn, purchase of, 563
Corporations, railroad, 20
Corridors, 36, 86
Cost of building, 27
  of drugs, 401
  of small laboratory, 391
Cotton, purchase of, 539
Couch, nurses', 177
Counters for pharmacy, 400
Couveuse, Child's Hospital, 138
Cove bases, 64, 67
Cows, 20
Crimea, 304
Cultures, throat, 340
Cunningham position, 360
Curled hair, padding of, 179
Curriculum, 305, 332, 334
Cutlery, purchase of, 570
Cystoscopic battery, 222

Dark rooms, 387
Death reports, 378
Decoration, hospital, 78, 132, 200
Department of hydrotherapy, 392
  of pathology, 379
Diagnosis, 379
Diet kitchen, 83, 170, 237
Diets, 20
Digalen, 373
Dining-rooms, 116
Directors, board of, 351
Discharge of patients, 345
Discipline in training-school, 310, 316
Diseases, children's, 20
  circulatory, 393
  communicable, 20
  ear, 20
  eye, 20
  gastro-intestinal, 20
  infectious, 20
  lung, 20
  nose, 20
  of nervous system, 393
  throat, 20
  women's, 20
Dish heaters, 83, 227
  washers, 83, 228
Disinfection, 161, 165
Disinfectors, 135, 168
Dispensing medicines, 400

Distribution of light, 87
Divorced women as probationers, 311
Doctor's call system, 93
  orders, 322
Donations, 21, 25
Door checks, 79
  frames, 77
  knobs, 79
  locks, 79
  screens, 198
  springs, 79
Doors, 77
Douche, 354, 394, 397
Drainage-tubing, 355
Drain-pipes, 93
Drains, bullet, 355
  cigarette, 355
  jacket, 355
Dressing boxes, 172, 378
  carts, 225
  rooms, 50, 83, 224
Drinking-water, refrigerated, 104
Drug refrigerator, 404
  stock, 401
  store, 400
Drugs, hypodermic, 375
Drums, 172, 211, 212, 352
Dry heat, 394
  tap, 376
Dumb-waiters, 110
Duntley vacuum cleaner, 159
Dust catchers, 176
Dusters, purchase of, 578
Duty on instruments, 383

Ear diseases, 20
Earnings accounts, 522
Eclipse head lamp, 223
Eggs, purchase of, 554
Electric bells, 91
  centrifuge, 382
  drums, 211
  incubators, 383
  light annunciator, 91
  plants, 81, 85, 87
  recorders, 92
  resetting devices, 92
  thermometer, 397
  warming pads, 87
Elevator doors, 109, 110
  safety devices, 110
  signals, 93–110
Elevators, 80, 81, 108
Employees, feeding of, 582
  hiring of, 592
  railroad, 20
Employees, trained, 593
Employers, 20
Enamel, white, 176, 545
Encaustic tile floors, 65
Endowment funds, 522
Engineering equipment, 82, 87
Engines, 81, 85
England, graduate nurses, 308
Epidemics in rabbits, 388
Equipment, details of, 79
  engineering, 82, 87
  for hydrotherapy, 396
  kitchen, 83, 226
  laundry, 80
  milk station, 133
  of operating-room, 204
  steam, 83
Ether, 369
  contra-indications, 374
  nitrous oxid-oxygen, 370
European plans, 37
Examination rooms, 135
Exanthemata, 163
Excreta sterilizer, 163
Ex-interns as pathologists, 381
Expenditures account, 522, 524
  architectural, 27
  classified, 26, 29
Expenses, running, 28
Exposed piping, 86
Eye diseases, 20

Facings, 52
Families of workmen, 20
Fans, 80
Faucets, Fuller type, 100
  hot-water, 100
  operating-room, 97
  self-closing, 173
Feeding the hospital, 582
Felt roofing, 59
Fevers, mountain, 20
Filing of slides, 386
Fillings, roof, 59
Filter-beds, 94
Filterization, triple, 173
Financial statement, 532
Financing the hospital, 20
Finishes, wall, 78
Fire protection, 95
Fireproof material, 55
Fish, canned, 553
  purchase of, 550
Fixtures, lighting, 86
  pharmacy, 400
Flaxseed meal, cost of, 401

Floor construction, 55
of laboratories, 384
pharmacy, 400
plans, 37
postmortem room, 387
Flooring, 57, 66, 132, 136
Florence Nightingale, 304
Food boilers, 83
cars, 245, 246
containers, 244
milk, 20
Foot props, 177
Foramen of Magendie, 376
Foreign microscopes, 383
Foreigners, 20
Foreword, 33
Formaldehyd, ammonia, 164
fumigation, 389
Formalin in catgut hardening, 363
Formula gauze, 352
medicines, 400
Foundations, 51
Fowler position, 186
Frames, door, 77
Franklin Company, 233
Free patients, 21
Freezing microtomes, 383
Freight lifts, 110
Frozen sections, 389
Fruits, canned, 565
purchase of, 558
Fuel, 81
Fumigation, 389
Funds, raising of, 21
Furnaces, 84
Furniture, 87
Furring, 73

Garbage cans, 382
disposal, 626
Garis-Cochrane dish-washer, 230
Gas, administration, 371
incubators, 383
regulators, 383
Gases, 161
Gastro-intestinal diseases, 20
Gauze, medicated, 351–353
purchase of, 539
Gelatin, 2 per cent., 353
Gendron Company, 193
General hospitals, 17–21
rules, 337
Genito-urinary department, 20
German silver piping, 97
water cures, 392
Gifts, individual, 25
Girders, 57
Glass fixtures, 401
floors, 65
Glassware, 546, 572
Gloves, rubber, 365, 368
Glow baths, 396
Glycerin, purchase of, 401
Goats, 20
Goose-neck reflector, 214
Graduate nurses, 308, 327, 330, 348
Granite mix, 53
Graniteware, 568
Green oil soaps, 575
Greensfelder, 184, 214
Guests, feeding of, 587
Guinea-pigs, 388
Gummed labels, 402
Gymnasium, children's, 135
Gynecologic table, 225

Hair mattresses, 179
Hall stairs, 139
Halls, 86
Hamilton Lowe dish-washer, 230
Hardware, 79
Harrington formula, 353
Hartley table, 207, 220
Haustetter (L. A.), 230
Head lamp, Eclipse, 223
nurse, 313, 346
Heads, training-school, 316
Heart diseases, 393
massage, 375
Heat, physics of, 161
prostrations, 392
radiation of, 172
sterilization, 161
Heating apparatus, 80, 86
Heat-insulating covering, 106
Heister gag, 373
Help in hospitals, 30
Hemoglobin, 382, 391
Henderson, 371
High beds, 177
High-pressure steam, 86
Hip, fractures, treatment of, 184
Hodgen splint, 184
Hollow clay tile, 55
Holt's bed, 182
Home life of pupil nurses, 324
Hoods, laboratory, 384
Hoppers, 168
Horsehair sutures, 354
Horsley's wax, 354
Hospices of Europe, 304
Hospital architecture, 33, 36, 86, 140, 156

Hospital beds, 180
  classes of, 17, 21
  Clinical Society, 300
  cost per cubic foot, 155, 156
  decoration, 78
  financing of, 20
  for children, 132–139
  furniture, 176
  help, 30
  literature, 156
  maternity, 139
  pathology, 379
  pharmacy, 400
  problems, 17
  superintendent, 255
  Supply Company, 207, 225
  support, 22
Hospitals, growth in number, 305
Hotel signalling systems, 91
Hot water in operating-tables, 208
Hot-water heating, 84, 87
House count, 528
  medical staff, 284
Household accounts, 523
Housekeeper, 580
Hydraulic lift, 165
Hydrotherapy department, 392, 397
Hygrometer, 216
Hypodermic tray, 373

Ice, 104
  boxes, laboratory, 390
Illumination, 81, 87, 88
Incandescent lights, 89
Income account, 524
Incubator room, 138
Incubators, 383
Index of slides, 387
Indirect lighting, 87
Infants' department, 132
Infants, premature, 378
  stillborn, 378
Infections, 20, 162, 361
Infectious department, 120
Inoculation cages, 389
Insane, chairs for, 195
  water cure of, 397
Insinger dish-washer, 228
Instrument cabinet, 215
  room, 50
  sterilizer, 83, 174
  table, 213
  tray, 174
    stand, 211
Instruments, dressing, 358
  duty on, 383
Instruments, laboratory, 382
  on trays, 355, 357
Insulation, 86
Interior lighting, 87
  painting, 78
Interns, 300, 305
  beds, 183
  feeding of, 584
  junior, 381
  rules for, 347
Introduction, 17
Invalid chair, 192
Iodin catgut preparation, 362
Iodoform formulæ, 352
Irrigator cast, 212
Irrigators, purchase of, 546
Isolation, 20, 340, 345
  building, 36, 288

Janitor's supplies, 577
Jewelry of dead, 378
Johns Hopkins apparatus, 371
Junior intern, 286, 381

Kangaroo tendon, 365
Kensington Engine Company, 164
Kick plates, 80
Kitchens, diet, 112, 138, 237
  equipment, 43, 83, 226
  location of, 44
  management, 582
  ranges, 226
  sinks, 231
  table, 226
  utensils, 568
Knobs, door, 79

Labarraque formula, 353
Labels, gummed, 400, 402
Labor unions, 330
Laboratories, ward, 382
Laboratory animals, 388
  central, 381
  equipment, 382
  of pathology, 170
  postmortems, 387
  technic, 381
Lamp, Eclipse head, 223
Lamps, 87
Laryngologist's, chair, 223
Laundry chutes, 624
  circulation of, 613
  equipment, 598, 602, 620
  floor plans, 607
  problems, 599
  rules, 608

Laws, nursing, 331
Lecture rooms, 86
Leg bake, 396
  rests, 184
Legislators, 21
Leitz microscope, 382
Lenses, light, 88
Lethal point, 169
Light, 82
  for postmortem room, 387
  regulation, 87–89, 90
Lighting, 82–87
  fixtures, 89
  for museums, 390
  laboratory, 387
Linen, bed, 599
  collectors, 620
  counting rooms, 624
  handling, 612
  purchase of, 541
  rooms, 621
  sterilizer, 162, 168
  typhoid, 169
Linoleum, 62, 132, 190, 384
Linseed oil, cost of, 401
Literature, hospital, 156
Lithotomy position, 360
Location of kitchen, 44
Lockers, 43, 134, 202
Locke's solution, 354
Locks, door, 79
Long pack, 352
Lysol, 354

Magnesia composition floors, 66
Maids, nursery, 132
Malaria, 20
Male nurses, 304, 335
Malinckrodt ether, 372
Mangle, 604
Marble fixtures, 401
  tiles, artificial, 64
Marine boilers, 80
Married women as probationers, 311
Masks, anesthetic, 371–373
Massachusetts General Hospital, 388
Massage, 375–396
Maternity department, rules, 343–346
  Hospital, 20, 139, 140
  nurses, rules, 347
Mattress sterilizer, 163
Mattresses, 178
Mayo's operating-room, 205
McArthur (L. L.), 207
Meat cutters, 232
  refrigerator, 238
Meats, purchase of, 550
Medical schools, 381
  staff, 263
  students, 381
  unit, arrangement of, 45
  wards, 20
Medicine cabinets, 403
Medicines, 400
Meinecke bed-pan, 546
Menus for employees, 582
Mercury, catgut preparation, 363
Metal doors, 78
  rockers, 191
Mice, laboratory, 389
Micro-organisms, pathogenic, 169
Microphotography, 387
Microscopes, 382
Microtomes, 383
Milch-goats, 20
Militarism in nurse training, 317
Milk food, 20
  station, 132
Milling terms, 20
Mineral springs, 392
Mistakes, architectural, 33
Mixed hospitals, 19
Modern trained nurse, 304
Modulating systems, 84
Monolithic cement roofs, 59
  floors, 63
Moore light, 89
Mops, purchase of, 578
Morgue, bodies for, 378
  box, 378
  sheets, 378
Morphin, 353–373
Morris chairs, 191
Mosaic floors, 64
Mother and baby, isolation of, 345
  care of, 349
Motor power, 80–82
Motors, 80
Mott control table, 399
Mountain fevers, 20
Museum cases, 390
  lighting, 390
  pathologic, 390

Nauheim baths, 393
Navy, United States, 214
Needle spray, 397, 399
Needs of community, 17
Nephritis, 382
New York City Hospital, 211
Nitrous oxid, 370–374
Noiselessness, 83

Non-condensing engines, 85
Nose, diseases, 20
Noxious gases, 20
Nursery maids, 132
Nurses and interns, 297
  beds, 183
  call, 91
  desk, 190
  dressing-room, 50
  feeding of, 584
  modern trained, 304
  rules for, 360
  signals, 93
  table, material of, 190
Nursing mothers, rockers for, 191

Oak rockers, 191
Oakum, 378
Object-lesson teaching, 324
Obstetric department, 20, 288
Oil, castor, cost of, 401
Oilcloth, 190
Oiled muslin, 355
Olives, purchase of, 566
Open-door policy, 276
Operating equipment, 208, 209, 358
  permit, 339, 345, 374
  rooms, 47, 82, 86, 87, 138, 169, 204, 351
    material, 162
    Michael Reese, 205
    sinks, 214
Operators, 338
Ophthalmologist's chair, 223
Organization support, 23
Ostermoor mattress, 179
Oven, paraffin, 384

Pails, purchase of, 578
Paint for laboratories, 386
Painting, children's department, 132
  interior, 78
Paracentesis, 377, 378
Paraffin microtome, 384
Partitions, 71
Passive resistance, 395
Pasteur, 305
Pastry kettles, 83
  pantry, 241
Pathogenic bacteria, 383
Pathologic Museum, 390
  sections, 390
  slides, 386
Pathology, department of, 379
  era of, 305
  in small hospitals, 390
  surgical, 380

Patients, admission of, 340, 344
  discharge of, 345
  feeding of, 586
  free, 21
  pay, 21
  position on table, 359
  preparation of, 359, 374
  push cord, 92
  rooms, lighting, 87
Pavilion architecture, 35
  isolated, 36
Pay patients, 21
Peas, purchase of, 561
Pediatric service, 288
Pennsylvania law, 331
Perfection bed-pan, 546
Permit, operating, 374
Petty cash book, 525
Pharmacy, 400
Philanthropists, 19–21
Photographic studio, 387
Physical examinations, 341
Physician, attending, 346, 381
Physiology of water cures, 392, 395
Pictures in sick room, 201
Pillows, curled hair, 179
Pilot light, 92
Pipe covering, 86
  shafts, 95
Piping, 82, 83, 86, 100
  German silver, 97
  water, 95
Placebos, 400
Planning the hospital, 36
Plans, American hospital, 37
  European hospital, 37
  floor, 37
  hospital, 142–156
  of unit, 38
Plaster partitions, 71
Plastering, 78
Plastic linoleum, 62
Playground, outdoor, 132
Playroom, children's, 135
Plinths, 64
Plumbing, 82, 93, 95
  control table, 398
Poisonous drugs, 402
Porcelain, grades of, 96
  sinks, 384
Portable bath, 200
  lamps, 87
Portland cement roofs, 59
Postmortem amphitheatre, 388
  processes, 382
  room, 387

Postmortem table, 388
Postoperative complications, 368
Posture in spinal puncture, 376
Potatoes, purchase of, 560
Poultry, purchase of, 553
Power plant, 80, 81, 82, 85, 173, 523
Practical nurses, 308
Preliminary training of nurses, 309
Premature infants, 378
Preparation of bodies, 378
Prescriptions, compounding, 400
Priestman ejectors, 94
Private charity, 21
  homes, children's beds in, 179
  hospitals, 19
  patients, feeding of, 591
  practice, nurses in, 329
  rooms, 117, 138, 177
Probationers, teaching of, 318
Provisions, 522
Public hospitals, 21
Pumps, vacuum, 84
Purchase of medicines, 400
  of supplies, 535

Quartz filter, 173
Quasi-public institutions, 24
Quiet rooms, children's department, 132
Quincke trochar and cannula, 376
Quinin, cost of, 401

Rabbits' laboratory, 388
Rack solution, 213
Radiators, 82, 85
Railings, stair, 71
Railroad corporation, 20
  employees, 20
  hospitals, 20
Raising of funds, 21
Ranges, kitchen, 226
Rats, laboratory for, 389
Receptacles for clothing, 202
Record books, 190
  of patients, 92, 381
Recreation, 310, 324
Reflector, goose-neck, 214
Reflectors, 88
Refrigeration, 86, 103, 238, 387, 390
Regulating valves, 84
Regulators, 82, 84
  light, 90
Reinforced concrete, 55
Religious orders, 304
Repairs, 523
Reports, daily, 538
  death, 378
Requisition form, 536
Research pathology, 379
Respiration, artificial, 375
Resuscitation in anesthesia, 376
Ringer's solution, 354
Rockers, 191
Roof fillings, 59
Roofs, 55, 58
Rooms, admission, 40, 135
  charges, 380
  isolation, children's, 132, 135, 341
  laboratory, 135
  milk station, 133
  sewing, 134
  soiled clothes, 134
  store-, 240
  surgical, 135, 138, 224
  wet nurses', 132
Rubber blankets, 547
  floors, 65
  gloves, 365, 368
  goods, care of, 355
    purchase of, 548
  sheets, 547
  tips, 190
  tissue, 355
Rugs in hospitals, 197
Rules, anesthetics, 373
  children's department, 340
  for graduate nurses, 328
  for interns, 347
  for maternity, 343, 347
  for nurses, 360
  for physicians, 279, 346
  for technic, 337
  for wet nurses, 342
  general, 328, 337
  surgical, 337
Running expenses, 28

Salaries and wages, 523
Sanitorium, baths for, 397
Sarah Morris Hospital, 132
Scanlan Morris Company, 166, 195
Schleich formula, 353
Schools of hydrotherapy, 392
  training-, 305
Schott exercises, 395
Scouring powders, 575
Screens, 79, 198
Senior intern, 289
Septic tanks, 94
Serums, 379, 390, 404
Serving-rooms, 46, 83, 87, 114, 189, 242
Sewerage, 93, 94, 168
Shades, 87

Shelf rack, 209
  stand, equipment, 358
Shipyards, 20
Shone ejectors, 94
Shower-bath, 396, 399
Sick room, books in, 202
    pictures in, 201
Side rails, 181
  rests, 184
  tables, 187
Signalling systems, 91
Silk sutures, 354
Silverware, purchase of, 570
Sims' position, 360
Sinks, 95, 100, 214, 231, 384, 388
Site of hospital, 34
Slate floors, 65
Slides, 382, 386
Small hospital, equipment, 247
    food for, 589
    pathology, 390
  laboratory, cost of, 391
Smears, 340
Soap containers, 215
  marble dust, 355
  purchase of, 573
Soil pipes, 93
Solution rack, 213
Solutions, 353
Sound-proofing, 73
Soup-stock boiler, 231
Special hospitals, 291
Specials, undergraduate, 325
Specimen bottles, 385
Specimens, laboratory, 382
Spencer microscope, 382
Spinach, purchase of, 564
Spinal puncture, 376
Sponge rack, 211
Sponges, 351
Spores, anthrax and tetanus, 162
Springs, door, 79
  mineral, 392
Squibb ether, 372
St. Bartholomew's Hospital, 306
St. Luke's Hospital, 211
Staff anesthetists, 369
  engineering, 82
  members, 351
Stair hall, 139
Stairs, 64, 69, 139
Stand, arm immersion, 213
  drum, 211
State Nursing Commissions, 331
Steam, physics of, 161, 169
  supply, 80, 87
Steam tables, 83, 228, 242
Steel beams, 57
  casings, 77
  frames, 77
Sterile water, 82, 173
Sterilization, catgut, 362
  gloves, 367
Sterilizers, 83, 161, 172, 383, 391
Sterilizing plant, 43, 48, 80, 247
Steward, hospital, 535
Stillborn, 378
Stock cages, 389
  drugs, 401
  inventory, 538
Stokers, automatic, 81
Storage-battery signals, 92
Storekeeper, 537
Storerooms, 35, 240
Street Company, 233
Students as technists, 380
Sun parlors, 117
Superintendent of hospital, 253, 262, 295
Superintendent's diary, 526
  report, 531
Supplies, purchase of, 535
Supply rooms, 49
Support of hospitals, 22
Surfacings, floor, 60
Surgeon's private assistant, 289
Surgery and dispensary, 523
Surgical anesthetic, 268, 378
  department, rules for, 337
  dressing-rooms, 50, 83
  pathology, 380
  wards, 20, 47
Swabs, toothpick, 378
Sweat cabinets, 396

Table, postmortem, 388
  service, 584
  water, control, 397
Tables, 187, 226
  laboratory, 386
  steam, 83
  surgical, 206, 213, 325
Tea urns, 236
Teachers of nurses, 318
Technic, hospital, 216, 305, 321, 337, 348, 380
Telephone system, 91
Temperature, control valves, 84
Terrazzo floors, 64
Test-tubes, care of, 385
Tetanus spores, 364
Teter apparatus, 217, 370
Thermograde systems, 84
Thermometers, 397

Women's auxiliary boards, 251
diseases, 20
wards, 20
Wood fixtures, 401
flooring, 57, 60
Woodwork, 76
Work-bench paints, 386
Work-benches, 386
Workmen's families, 20
Woven wire, 56
Written consent for operation, 339

YEOMAN'S ejectors, 94

ZANDER outfit, 132
Zeiss microscope, 382

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.

NOV 11 [illegible]
AUG 28 1914
MAR 22 1915
NOV 22 1915
11 1915
Feb. 8, 1917.
DEC 5 1918
[illegible]
JUN 16 [illegible]
DEC 26 22
JUL 31 '24
SEP 22 '26
[illegible]
MAR 30 27
SEP 28 1929
JUL 13 1931
May 13

I963
H814
1913
Hornsby, J.A. 29605
The modern hospital
NAME
DATE DUE
Merced County
Free Library
Dr. Wilbur
J. H. Wallace
Dora Martin
Kathryn Dorgo
29605